

PROCEEDINGS
OF THE
CATTLE CONFERENCE

*Held at Bangalore on 22nd
and 23rd January, 1924*

WITH APPENDICES



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No. 550 P. of 1924.

FROM

S. MILLIGAN, Esq., M.A., B.Sc.,
Agricultural Adviser to the Government of India,

TO

THE SECRETARY TO THE GOVERNMENT OF INDIA,
DEPARTMENT OF EDUCATION, HEALTH AND LANDS,
DELHI.

Pusa, 4th March, 1924.

SIR,

I have the honour to submit the Proceedings of the Cattle Conference held at Bangalore on the 22nd and 23rd January 1924. These proceedings have been recorded by Mr. W. Smith, Imperial Dairy Expert, who acted as Secretary. The proceedings have been approved by the Conference.

I have the honour to be,

SIR,

Your most obedient servant,

S. MILLIGAN,

Agricultural Adviser to the Government of India.

PROCEEDINGS

OF THE

Cattle Conference

held at Bangalore on 22nd and 23rd January 1924.

The First Cattle Conference was held at Bangalore on 22nd and 23rd January, 1924, under the presidency of Mr. S. Milligan, M.A., B.Sc., Agricultural Adviser to the Government of India and Director, Agricultural Research Institute, Pusa.

The members present were :—

1. S. Milligan, M.A., B.Sc., Agricultural Adviser to the Government of India and Director, Agricultural Research Institute, Pusa. (President.)
2. W. Smith, Imperial Dairy Expert, Bangalore. (Secretary.)
3. G. S. Henderson, N.D.A., N.D.D., Imperial Agriculturist, Pusa.
4. F. J. Warth, M.Sc., Physiological Chemist, Bangalore.
5. H. Cooper, M.R.C.V.S., Pathologist, Imperial Bacteriological Laboratory, Muktesar.
6. Lieutenant-Colonel J. Matson, Assistant Controller, Military Dairy Farms, Northern Division, Kasauli.
7. R. S. Finlow, B.Sc., F.C.S., Offg. Director of Agriculture, Bengal.
8. H. H. Mann, D.Sc., Offg. Director of Agriculture, Bombay.
9. E. J. Bruen, Deputy Director of Agriculture for Animal Breeding, Bombay.
10. R. D. Anstead, M.A., Offg. Director of Agriculture, Madras.
11. R. W. Littlewood, N.D.A., Deputy Director of Agriculture for Live Stock, Madras.
12. A. D. Aitchison, M.R.C.V.S., Principal, Veterinary College, Madras.

13. A. C. Dobbs, B.A., Director of Agriculture, Bihar and Orissa.
14. D. Quinlan, M.R.C.V.S., Director, Civil Veterinary Department, Bihar and Orissa.
15. C. H. Parr, B.Sc., Deputy Director of Agriculture for Cattle Breeding, United Provinces.
16. Captain S. G. M. Nickey, M.R.C.V.S., Offg. Veterinary Adviser to the Government of the United Provinces.
17. Colonel G. K. Walker, C.I.E., O.B.E., F.R.C.V.S., Principal of the Punjab Veterinary College.
18. Sirdar Daishan Singh, M.R.A.C., Deputy Director of Agriculture, Punjab.
19. D. Clouston, C.I.E., M.A., D.Sc., Director of Agriculture, Central Provinces.
20. Mr. S. T. D. Wallace, V.C., B.Sc., Deputy Director of Agriculture in charge of Animal Husbandry, Central Provinces.
21. J. Charlton, M.Sc., A.I.C., Agricultural Chemist, Burma.
22. Rai Bahadur Kanak Lal Barua, B.L., Director of Agriculture, Assam.
23. J. N. Chakravarty, B.A., M.S.A., M.R.A.S., Deputy Director of Agriculture, Assam.
24. W. Davison, B.S.A., Live Stock Expert, Mysore.
25. Major R. W. Simpson, G.B.V.C., M.C., Superintendent, Civil Veterinary Department, Mysore.
26. C. V. Sane, M.Sc., B.Ag., Director of Agriculture, Baroda.
27. Mazhar Husain, M.A., B.Sc., Director of Agriculture, Hyderabad.
28. Ganesh Dutt, B.A., M.R.A.C., Deputy Director of Agriculture, Gwalior.
29. Rao Bahadur K. Nadkar, Diwan, Dhar State, Central India.
30. S. Higginbottom, M.A., B.Sc., Principal, Allahabad Agricultural Institute.
31. K. W. Forman, B.S.A., Professor of Dairying and Animal Husbandry, Allahabad Agricultural Institute.
32. Zal R. Kothavala, B.Ag., B.Sc., N.D.D., Dairy Superintendent, Bombay Municipality.
33. F. B. Traynor, Superintendent, Imperial Institute of Animal Husbandry and Dairying, Bangalore.

P R O G R A M M E .

The programme before the Conference consisted of the following subjects approved by the Government of India for discussion :—

I. Subjects VII, VIII and IX on the agenda of the Thirteenth Meeting of the Board of Agriculture in India :—

Subject VII.—To examine the curriculum of the Imperial Institute of Animal Husbandry and Dairying at Bangalore and to consider the best means of co-operating with Provincial Governments and Indian States with a view to utilizing this Institute to the best advantage.

Subject VIII.—To consider the best means of utilizing Pusa, Bangalore, Wellington and Karnal dairy and cattle-breeding farms for the good of India as a whole.

Subject IX.—To review the steps being taken by Provincial Governments and Indian States for the improvement of cattle by better breeding and feeding and to make recommendations.

- II. (a) Aspects of the cattle-breeding problem on which common action seems necessary.
- (b) Cattle-breeding problems where the policy of one province or State particularly concerns other provinces or States.
- (c) Breeding operations, the distribution of pedigree stock, and the utilization for educational purposes of Government dairy farms in India.
- (d) Encouragement of the formation of pedigree herds of Indian cattle throughout the country. The control of pedigree records and the issue of pedigree and health certificates for all stock from such herds.
- (e) Grant of special facilities to cattle-breeders with a view to the improvement of their herds.
- (f) The development of the dairy industry in the country.
- (g) Disposal of surplus animals from all herds of Government cattle, and where practicable from private-owned pedigree herds, and discouragement of the sale of unsuitable entire animals for use for stud purposes in the country.
- (h) Provision of facilities for the transport by rail of live-stock, fodder and milk.

- (i) Consideration of existing facilities for the supply of milk to large towns and the possibilities of their improvement.

FIRST DAY.

The President read out the resolutions of the last Board of Agriculture regarding the formation of a Central Cattle Board. He intimated that Government could not see their way to sanction the Central Cattle Board but suggested periodical conferences of those connected with the industry of which this is the first. He added that this Conference would discuss Subjects VII, VIII and IX on the agenda of the present Board and report thereon to the Board, thereby acting as a Sub-committee. He pointed out that a Conference, as proposed by Government, although not fulfilling the functions desired for a Central Cattle Board, would do a great deal of good in that it will periodically bring the people concerned together. He proposed that the subjects on the agenda of the present Board should be taken first, and proceeded to deal with—

Subject VII.—To examine the curriculum of the Imperial Institute of Animal Husbandry and Dairying at Bangalore and to consider the best means of co-operating with Provincial Governments and Indian States with a view to utilizing this Institute to the best advantage.

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uration of
urses.

Mr. Smith referred to the curriculum for the dairy managers' diploma (p. 21), at the newly established Imperial Institute of Animal Husbandry and Dairying, and explained the position as regards the future working of this Institute.

A point was raised by Rai Bahadur Barua as to the educational qualifications, required from students at the Institute.

Mr. Higginbottom referred to the necessity of a revision of these qualifications, and stated that at the end of the first session the question of the length of the course and the educational qualifications of candidates should come up for review.

Colonel Walker doubted if two years would be found sufficient for the course as outlined but agreed that experience alone could decide this. He intimated that he did not consider advanced scientific qualifications necessary as the course was one for dairy managers.

Mr. Dobbs agreed.

Colonel Matson was of opinion that the whole question of these two points could only be dealt with after the Institute had some

experience concerning the class of pupils likely to take this course.

Mr. Henderson said it was much more important that the pupils should know all about the practical and scientific sides of dairy work at the end of the course than high educational qualifications for new entrants should be insisted on. He added that the examination should be conducted by neutral persons and not by the teaching staff.

Mr. Bruen suggested the formation of two more courses, each to last six months, to train men now in Government employment on specified subjects connected with dairying. These courses should be entirely practical.

Mr. Higginbottom thought that any short course lasting less than a year would not be effective because climatic conditions varied much throughout the year. Generally speaking, he was against short courses.

Mr. Parr stated that he was entirely in favour of short courses and that there was a real demand in the country for this class of training.

Mr. Smith suggested that the success of such teaching depended more on the type of student than on his educational qualifications.

Mr. Henderson stated that at the Kilmarnock Dairy School all sorts of people were taken for the special short courses in specific dairy subjects, each case being considered by the authorities on its merits.

Mr. Bruen explained that the type of man he wished training for would only require to be instructed in a particular class of dairy work.

Mr. Davison indicated that he was entirely in favour of these short courses.

Mr. Dobbs suggested that Subject-I of the syllabus for the dairy managers' diploma might be entirely eliminated, but after some discussion it was generally accepted that this could not be done without injury to the curriculum.

Mr. Davison stated that he found in his experience as an agricultural teacher in Mysore that more theoretical instruction was necessary in India than amongst Western nations.

Mr. Sane enquired if the men who would get the dairy managers' diploma would compete with agricultural graduates.

Mr. Smith replied this was unlikely.

Mr. Forman proposed the addition of an extra subject to the curriculum for the dairy managers' course, *viz.*, "The principles of Co-operative Dairying." This was agreed to by the Conference.

is employment
outside exam-
iners.

Dr. Mann concurred in the opinion previously expressed that outside examiners only should be employed in examining for the diploma. This was agreed to.

It was finally proposed by Colonel Walker and seconded by Dr. Clouston and passed unanimously:—

This Conference approves of the institution of an Indian dairy diploma and of the curriculum drawn up by the Imperial Dairy Expert with the addition of the principles of co-operative dairying.

Dr. Mann raised the question of the work to be done by post-graduate students at the Imperial Institute of Dairying, and it was agreed that he should later on discuss the subject with the President and Mr. Smith.

The Conference then proceeded to consider—

Subject VIII.—To consider the best means of utilizing the Pusa, Bangalore, Wellington and Karnal Dairy and Cattle-breeding Farms for the good of India as a whole.

In opening the discussion, the President said that the policy outlined for these Imperial farms was as follows:—

Bangalore.—(1) The system carried out by the military dairy farm of breeding towards Ayrshire and Holstein stock will be continued. (2) A small pure bred Sindhi herd will be maintained, selective breeding on milk records being followed. (3) A small pure Jersey herd for experimental purposes will be built up. (4) A small herd of Murra buffaloes for demonstration purposes will be kept.

Wellington.—As at (1) above but a few thorough bred Ayrshires have been imported and an attempt will be made to produce pedigreed Ayrshire cattle there.

Karnal.—(1) A pure bred herd of Thar-Parkar cattle has been established and will be developed on dual-purpose lines. (2) A small number of Thar-Parkars will be crossed with European blood for experimental purposes. (3) A small herd of pure bred Jerseys will be maintained to test their ability to stand the climatic conditions.

Pusa.—(1) The pure bred Montgomery herd will be maintained and further developed on existing lines. (2) Further selective breeding will be done in connection with cross-crosses. (3) Cross-breeding experiments as hitherto will be maintained. (4) Half-bred Ayrshire-Saniwal cows will be sired by a first class Montgomery bull of a milking strain with a view to preserving the heavy milk yield of the half-bred, and restoring the immunity to disease of the Saniwal.

tribution of
half-bred bulls.

Dr. Mann asked for information regarding the policy at Bangalore and as to whether half-bred bulls could be utilized for distribution in rural areas.

Mr. Davison explained the difficulties his Government has had in disposing of half-bred bulls from the Mysore State Dairy, and at the request of the President Colonel Matson stated that very valuable data was available in connection with the work which

the military dairy farms had done in the matter of cross-breeding generally with imported bulls.

Mr. Dobbs thought Colonel Matson should be asked to compile a note on the subject giving full details of all that the Military Department had done in this connection.

Rao Bahadur K. Nadkar referred to the experience of the Dhar State in using cross-bred cattle.

Colonel Walker called attention to the low degree of immunity to epizootic diseases which these animals carried.

Dr. Mann suggested that the Imperial breeding and dairy farms should deal with all questions relative to cattle-breeding which were of a general nature.

Mr. Higginbottom pointed out that in the end all these operations must be governed by the economic factor.

Colonel Matson agreed with Dr. Mann and further suggested that breeding farms in the provinces and Indian States should experiment primarily with local breeds. This Dr. Mann strongly supported.

Colonel Walker referred to the importation of outside stock into India and to a resolution passed by the Veterinary Conference at Lahore in 1919 indicating what the Veterinary Department believed to be the dangers underlying the distribution of half-bred or imported bulls. He referred to the conditions prevailing at Hissar and to the methods of working there. He explained that milk records were not kept at Hissar owing to paucity of staff and recommended that the Haryana breed should be taken up for development at Karnal. He believed the Punjab Government would gladly co-operate in providing a nucleus stock of good milking cows from Hissar and he suggested that Mr. Smith should go there and select these.

Mr. Smith stated that he would very gladly take up the development of the Haryana cow on dual-purpose lines at Karnal and thought that the financing of such experiments could be arranged.

Mr. Quinlan asked if it were necessary that the Karnal farm should pay.

Mr. Smith explained the financial position there.

Colonel Matson stated that he thought it would be a good thing if the Karnal farm could also take over the pure bred Haryana stock from the Military Department at Cawnpore. He thought that about 20 animals were available for transfer.

The President and Mr. Smith agreed that this should be desirable if the Military Department wished to part with these animals.

Colonel Matson stated that in his opinion it was no use going further in cross-breeding with imported blood until they know definitely the results of mating the crosses with the crosses.

Mr. Littlewood and Mr. Henderson replied that experiments to determine this point were being carried out at Pusa and Coimbatore.

Colonel Walker referred to the difficulty of keeping cattle in India under ideal conditions.

Colonel Matson was of opinion that research should be carried out on the lines of proving if any of the Western breeds of cattle would thrive as pure breeds in India.

Colonel Walker was of opinion that at present this should be done on purely experimental lines, and he emphasized the fact that it was unlikely that any Western breed could permanently take the place of the excellent indigenous cattle of the country.

Mr. Sane suggested that experiments should be made in this direction with the Brown Swiss breed.

The President stated that it was the feeling of the meeting that further experiments in this direction should be carried out by the Imperial Department of Agriculture.

Mr. Higginbottom asked if at an early date there was likely to be established in India some central authority from which the results of all cattle-breeding experiments could be obtained by those interested.

The President explained that this question would be taken up later.

The Conference then proceeded to deal with—

Subject IX.—To review the steps being taken by Provincial Governments and Indian States for the improvement of cattle by better breeding and feeding and to make recommendations..

The President called attention to the importance of this subject and invited the representatives of Governments present to express their views.

Dr. Clouston referred to his note (p. 36) defining the work done in the Central Provinces and gave details of the various activities of his Government in connection with cattle-breeding.

The President asked Dr. Clouston if he did not think it would be advisable in all the various districts of his province to develop a type of animal particularly suitable for that district.

Dr. Clouston replied that their general policy had been based on these lines.

Mr. Wallace emphasized the popularity of the Montgomery bull in his province and complained of the difficulties of obtaining pedigree animals of this breed.

Mr. Dobbs stated that in his province an attempt was being made to build up the local breeds particularly in the direction of milk production, but pointed out that cultivators in Bihar and Orissa would have nothing to do with the Montgomery bull.

Mr. Henderson asked Dr. Clouston what price his Government could afford to pay for suitable Montgomery bulls.

Mr. Wallace replied that after paying freight, etc., on a bull costing Rs. 150 at Pusa, they had no difficulty in obtaining Rs. 250 for this animal from the cultivator.

Colonel Walker asked if the Malvi breed could not be more utilized in the Central Provinces.

Dr. Clouston replied that his Government had a pure bred Malvi herd. He stated that these were first-class draft bullocks but of little use from the milk point of view.

Mr. Bruen described a Malvi-type of cattle which were good milkers, and intimated that he hoped his Government would one day provide facilities for developing this breed.

Rao Bahadur Nadkar explained the various localities in which the different classes of so-called Malvi cattle were found.

With regard to Bombay, Dr. Mann explained that his Government had devoted their energies to the development of four different types of Bombay cattle—Kankrej at Chharodi and Surat, the Amrit Mahal at Bankapur and the Sindh and Thar-Parkar at Karachi. Their efforts, he indicated, in developing and distributing these breeds, had of late years achieved a measure of success and the demand for bulls and the general interest taken in the cattle question in Bombay had greatly increased.

Mr. Bruen stated that he was against crossing of any kind whatever, and gave it as his opinion that the present deplorable condition of Indian cattle was due to indiscriminate crossing.

The President complimented the Bombay Government on the work they had done in connection with cattle-breeding, and called upon Mr. Anstead to say a word as to what the position was in Madras.

Mr. Anstead referred to the notes submitted (pp. 27 and 48) and particularly referred to the difficulty in financing cattle-breeding schemes. He stated that he was anxious that a member of his

scientific staff should be enabled to undertake special research work on animal nutrition in co-operation with the Physiological Chemist.

Mr. Littlewood briefly described the position in his area as outlined by his note and referred the Conference to the text of the same (pp. 27 and 48).

Mr. Aitchison described to the meeting the evolution of the milk cow in Madras from the pure Ongole of fifteen years ago to the present day situation where 80 per cent. of the milk cattle of that city were European crosses of one sort or another.

Mr. Littlewood described the position in Madras in connection with the development of the Ongole (Nellore) cow, and stated that to day a good milking cow of any breed in Madras would fetch Rs. 300, whereas a poor milker was only worth about Rs. 40.

The Conference agreed to recommend that the further development of the Ongole cattle farm in the Madras Presidency was urgent and desirable, and that the establishment of a farm for the development of the Kangayam breed of cattle should be established in that presidency.

Mr. Littlewood explained the necessity for a Government buffalo farm in the Madras Presidency and the system of crossing the local buffalo with Delhi buffalo bulls and the issuing of the progeny of this cross in the district.

Mr. Finlow referred to the operations of the Government of Bengal and its policy in regard to cattle-breeding, and stated that the possibility of obtaining a dual-purpose cow at Rungpore by crossing with Hansi type animals was promising.

The President expressed the fear that the breed now being evolved at Rungpore might be found too large for the districts, and that this factor would have to be taken into consideration in future. He also referred to a visit lately paid to the Rungpore farm and to the marked improvement in the cattle there.

Mr. Finlow gave the Conference a brief outline of a scheme drawn up by the Agricultural Adviser to the Government of India for utilizing part of the Pusa herd in Bengal in order to demonstrate the economic production of milk for the Calcutta market.

- a. Mr. Dobbs stated that it was necessary in discussing cattle in Bihar and Orissa to remember that there were no definite breeds of cattle in the province.

Mr. Quinlan explained the efforts of his department regarding bull distribution and emphasized the necessity for establishing a Government breeding farm in the Shahabad District with the object of developing a suitable Indian breed of dual-purpose cattle.

There was a strong demand for plough bullocks in the district and for milch cattle in the industrial area (coal fields) near by.

In reply to a suggestion by the President that as an experimental measure a few bulls might be bought and distributed in this area, Mr. Quinlan pointed out that his department could not properly look after one or two bulls. This sort of thing must be done in numbers if the necessary control of the animals was to be retained after distribution.

Mr. Bruen stated that he could provide a nucleus herd of Karikreji cattle for Bihar, but Mr. Quinlan doubted if this breed would be suitable in his province.

Mr. Henderson characterized the breed as showing signs of softness under North Bihar conditions.

In reply to Mr. Parr who asked if he had had any experience of the United Provinces cattle in Bihar, Mr. Quinlan stated that he had no personal experience.

Before the Conference adjourned for the day, Mr. Higginbottom raised the general question of the economic importance of cattle-breeding from a national point of view.

The President suggested that he should prepare a note on the subject which could be utilized as a preamble for the report of the Conference.

SECOND DAY.

The Conference resumed on the morning of the 23rd January, 1924.

The President called upon Mr. Parr to say what the Government of the United Provinces were doing regarding cattle-breeding in that province.

Mr. Parr explained that the policy as originally laid down by the Civil Veterinary Department with slight modifications had been approved of by the Provincial Cattle Committee of his province. He went on to say that they had two main breeding farms in the province which principally dealt with two breeds—the Hissar imported from the Punjab and the local Mewati. There was a great demand in his province for bulls of the Mewati type. In addition to those reared at the Government farm, he bought numbers of yearlings and reared them until three years old when they were issued to the districts. He explained that, in addition to these two breeds, his Government maintained a herd of Montgomery cattle for the special purpose of providing stud bulls of a milking

type, but the demand for this class of cattle was practically nil, as the bullock sired by the Montgomery was not suitable for field work in his province. Mr. Parr pointed out that a dual-purpose animal was desired but, failing that, draught qualities were considered of more immediate importance than milk. He hoped eventually to start a special herd for developing the dual-purpose type by selection from the Hissar and Mewati breeds, and he would also like to keep a pure herd of Murra buffaloes as bulls of this type were in demand.

Colonel Matson agreed with Mr. Parr that Meerut would be an excellent situation for locating such a farm, and expressed the view that he was quite certain that Hissar cattle would do well there.

The President suggested that the United Provinces Government might consider a slight change of policy and drop the Montgomery breed altogether seeing that there was no demand for the bulls.

Mr. Parr described an experiment he was carrying out in the direction of acclimatizing Montgomery cattle in the Terai districts which gave promise of good results.

The President complimented Mr. Parr on the soundness of the provincial programme, and the Conference cordially supported his scheme for the establishment of a farm in the Meerut District.

The President then called upon Colonel Walker to give the meeting a review of the work being carried on in the Punjab.

Colonel Walker at the outset referred to the great quantity of literature available on the subject of cattle-breeding in the Punjab, and reviewed the history of the progress of Government effort in this connection since its inception. He specifically described the history of the Hissar cattle farm from the time it was taken over from the Military Department until the present day, and explained that a dairy had at one time been maintained on this farm but owing to financial considerations and in order to make sure that calves got all the milk of their dams it had ceased to function many years ago. He went on to say that he was altogether in favour of dairy records, and considered that the dairy managers' course now inaugurated at Bangalore would be valuable in the direction of providing trained managers to run the dairies in connection with the larger cattle-breeding farms. He quoted extracts from a paper submitted by Mr. Quirke (p. 28) and explained very clearly the system of bull distribution in the Punjab, recounting the gradual progress which Government had made in getting District Boards and private individuals to appreciate the supply of stud bulls provided. He added that to-day most of the stud bulls issued by his

department in the Punjab were purchased at half cost by the users. Colonel Walker gave a description of the policy in the Punjab of giving grants of land to encourage cattle-breeding on condition that the grantees maintained pure herds of different types of cattle and complied with stipulations of the Veterinary Department concerning the breeding, rearing and disposal of these animals. He specially referred to the difficulty experienced in distributing Montgomery bulls: He mentioned that the proposals of his department for the establishment of a special breeding farm in the Dhanni tract had not materialized owing to financial stringency, and consequently bulls of this type were being purchased and distributed for stud purposes, but he hoped that the Punjab Government would shortly have a farm in the Salt Range for breeding Dhanni bulls.

In reply to Mr. Aitchison, Colonel Walker stated that there was a very considerable foreign demand for Hissar cattle which was met as far as possible from the Government farm at Hissar.

The President pointed out the importance of cattle-breeding in the Punjab from the point of view of the whole of Northern India, and gave it as his opinion that the Punjab was the premier cattle-breeding province in India. Referring to a paragraph in Mr. Quirke's note (p. 35) which he read out, he stated that reliance on actual performance such as were to be obtained from milk records was preferable than judging animals purely from external appearances.

Colonel Matson stated that in his experience it was necessary to adhere to the Montgomery type if they wished to preserve the milking qualities.

In reply to Mr. Smith, Colonel Walker stated that he believed that more rapid progress in the development of the Montgomery breed would have been made if his Government had established their own breeding farms instead of depending on grantees for this purpose.

Colonel Matson stated that undoubtedly great progress had been made in the Punjab in connection with cattle-breeding, but he felt compelled to say that he considered the policy there fell short of the requirements of that province. He referred to a dairy farm of one of the grantees under official control with a herd numbering 400 Montgomeries without a single bull of known dairy or milk producing lineage.

Mr. Smith stated that he was of opinion that in the future authentic milk records should be kept in the Punjab of all herds of the milk breeds.

Colonel Walker agreed with both Colonel Matson's expression of opinion and Mr. Smith's suggestion.

The President, in calling upon Mr. J. N. Chakravarty to speak for Assam, explained the conditions relative to cattle-breeding in that province as he knew them.

Mr. Chakravarty regretted that up to the present his Government had evolved no cattle-breeding policy and that they had done very little in the direction of developing this industry. He referred to Mr. Blackwood's cattle survey and recommendations of 1912 but added that nothing had been done on this report.

Dr. Mann stated that what Assam required was a definite policy which could only be defined by a qualified expert.

Colonel Matson and Mr. Aitchison called attention to the significance of the mitton or wild ox of Assam, and Mr. Aitchison suggested that a cross between these animals and the cow might prove valuable for Assam conditions.

Mr. Davison explained what had been done in Canada in crossing the American bison with the domestic cattle of Canada and the results achieved therefrom.

It was agreed by the Conference that no definite policy could be laid down for Assam without expert examination of local conditions, and that such expert advice should be obtained and a clearly defined cattle-breeding policy laid down as early as possible.

The President then called upon Mr. Mazhar Husain.

Mr. Mazhar Husain stated that his Government had a cattle-breeding farm under the control of their Veterinary Department. He explained the system of distributing bulls and looking after them after distribution. His State had done nothing in developing milch cattle. The Ongole breed was kept at the Government farm. A system of purchasing bulls for distributing was in vogue and the Veterinary Department distributed these throughout the State. A cross-bred bull between the Ongole and the local breed was popular. Mr. Husain explained that the Agricultural Department hoped to start a cattle-breeding farm soon, and that it was proposed to transfer cattle-breeding operations from the Veterinary to the Agricultural Department at an early date.

On behalf of the Mysore State, Mr. Davison indicated that the cattle problem there was being tackled in two different ways. He gave as his opinion that the milk problem was not so acute as in other parts of India. He described in detail the fine breed of Amrit Mahal draught cattle in Mysore. The demand for export to other parts of India and to foreign countries for this breed was

large, and it was the policy of his State to encourage it. At the present moment the State purchased and issued stud bulls through local boards and maintained similar animals at the veterinary hospitals throughout the State. Mr. Davison expressed himself as in favour of subvention of private individuals or firms to induce them to breed suitable bulls for stud purposes. The Amrit Mahal Department had lately been transferred to the Agricultural Department. The department, which controls a State pure bred herd this is famous breed, was established in the 18th century. Mr. Davison stated that he believed this particular breed was probably as pure and as true to type as anything in the country, and he considered that the prospects of improving the breed and of developing its draught qualities in particular were very promising. In spite of financial difficulties he had to encounter he looked for great results in the future from the 20 large pure bred herds of this breed under his control. The idea of his department regarding dairying was to build up a herd of heavy milk yielding dairy cattle, particularly for the urban areas. For this purpose the State has a dairy farm at Mysore financed by His Highness himself where Sindhi and local cows are crossed with imported Holstein bulls.

Mr. Davison described the small stunted cattle found in the western districts of Mysore (Malnad). He pointed out that so far his department had not been able to tackle the problem of the improvement of this breed.

The President called attention to the fact that the solving of that problem would be of great interest to the country at large, as similar types of cattle existed in many of the wet tracts of India. The Conference agreed that it would be of great value to the country if the Government of Mysore could undertake the work of developing these cattle.

Mr. Warth raised the point as to the nutritive value of the available fodders in the Malnad area for cattle of different ages.

Mr. Davison called attention to the vast importance of feeding problems generally, and especially referred to the total lack of reliable information concerning chemical analyses and especially the digestibility of Indian feeding stuffs. He welcomed the establishment of the Imperial Institute of Animal Husbandry and Dairying in Bangalore and the presence of Mr. Warth at this Institute.

Mr. Warth described the work done by his department in connection with animal nutrition work since the sanction of Government to the appointment of the Physiological Chemist, and emphasized the necessity of increasing the facilities for this class of work in the future.

Mr. Anstead offered assistance in the work from Coimbatore.

At Mr. Parr's request Mr. Davison gave particulars of his system of touring stud bulls and referred to that part of his note (p. 41) which dealt with the subject. He gave it as his experience on the whole that the touring bull did more useful work than the stationary one.

Rao Bahadur Nadkar asked the reason why this touring system had been adopted.

Mr. Davison replied that the touring bulls did more work than the non-touring bulls, and this system was popular with the cultivator. Replying to an enquiry from Mr. Wallace, Mr. Davison said that the Mysore Government charged R. 1 per service for the use of stud bulls.

The President, in calling upon Mr. Sane to indicate what had been done in the Baroda State, drew attention to the very excellent note he had submitted to the Conference (p. 43) on the subject under discussion.

Mr. Sane amplified the points dealt with in his note and asked for an expression of opinion of the Conference on certain specific points raised in the same. He particularly referred to the impossibility of getting the cultivator to use male buffaloes and to the long dry periods as shown by the records of the Gir cows of Baroda.

Colonel Matson stated that in his opinion this defect of irregular breeding was a breed one.

Mr. Henderson thought that certain strains of the same breed showed this defect more than others. He pointed out that the weaning of the calf would facilitate regular breeding, and stated that at Pusa the Montgomery cows which were weaned gave a calf every 14 months and those of the same breed which suckled their calves only yielded a calf every 17 months.

Mr. Traynor pointed out that it was impracticable to wean cows which had their calves with them in previous lactations.

Mr. Bruen entirely agreed with this.

Colonel Matson stated that in the farms under his control the weaning of all classes of cows had been successfully carried out.

After further discussion the Conference were of opinion that it would not be advisable for the Baroda State to introduce Sindhi blood into their pure bred Gir herd for the purpose of obtaining more regular breeding.

Mr. Baluch, a post-graduate student at the Imperial Institute, Bangalore, was permitted by the President to describe his experience in connection with herds of Gir cattle at Junagadh and Nava-

nagar and the improvement made in reducing the dry periods of these herds by careful treatment and feeding.

The President called upon Mr. Ganesh Dutt for a description of the work done by the Gwalior State.

Mr. Dutt stated that his Government had a cattle-breeding farm under the control of its Veterinary Department where Hansi cattle were crossed with the local breeds. He intimated that his Government hoped to shortly establish a pure bred herd of Malvi animals. He told the Conference that a dual-purpose animal would be the most popular type for his State.

On being called on by the President, Rao Bahadur K. Nadkar, Diwan of the Dhar State, referred to the interest which His Highness the Maharaja of Dhar took in the cattle-breeding question. He explained that part of Dhar State was located in what was known as Malva and part in Nimar, and owing to the fact that two arterial main roads, namely, that from Bombay to Agra and the road from Mhow to Neemuch, passed through his State, they had the opportunity of seeing numbers of cattle of many breeds and types. In his State there were two distinct indigenous breeds—Malvi and Nimari—and these again were divided up into sub-breeds suitable to the various tracts in which they were found. The State gave special facilities to cultivators to breed animals of both breeds and to preserve the purity of these types. Rao Bahadur Nadkar explained the difficulty in introducing milking qualities into the local breeds as the people did not use milk freely in their diet. He gave particulars of the State cattle farm at Dhar where a pure bred Sindhi herd had been maintained. The bulls from this herd were being issued to cow breeders desirous of improving their milking strains. He gave it as his opinion that for milk producing purposes the Sindhi was likely to be more profitable in his part of the country than the Gir.

The President called attention to the fact that this State kept a cattle-breeding farm for an area of some 1,750 square miles and said that this was an example for the whole of India.

Mr. Smith described a visit he had paid to Dhar and expressed his appreciation of the work which the State had done. The Conference approved of the policy and endeavours of this State in connection with cattle-breeding.

A lengthy discussion took place regarding the formation of some central body to stimulate interest in cattle-breeding in view of the adverse decision of Government on the proposal of the last Board of Agriculture. It was agreed to recommend—

Central Cattle
Bureau.

That a Central Bureau of Animal Husbandry be established at Pusa under the control of the Agricultural Adviser to the Government of India, and with the Imperial Agriculturist as Secretary, and that the Secretary be given sufficient technical and clerical assistance to adequately deal with the work of this Bureau as it develops. The main functions of this Bureau to commence with would be :—

- (a) *The collection and dissemination of information concerning cattle-breeding and allied subjects.*
- (b) *To assist in the disposal of surplus pedigreed stock specially from Government herds.*
- (c) *The standardizing of methods of milk recording and breed records to be adopted by Local Governments and Indian States.*
- (d) *The maintaining of general herd books of breeds, or of milch cattle as distinct from specific breeds found in more than one province or State.*
- (e) *The encouragement of the sale and use of pedigreed stock.*
- (f) *The keeping of the cattle-breeding departments of Local Governments and Indian States and those specially interested in scientific cattle-breeding in touch with each other.*

The Conference next adopted the following resolution :—

That in future a Conference on similar lines and of similar composition and size to this be held yearly at centres to be agreed upon, the place of meeting to be selected by each Conference for its succeeding meeting. The Conference further recommends that the necessity for providing facilities to enable all officers interested to attend this Conference be impressed upon all Local Governments and Indian States.

The President then introduced the subject of breeding records and the establishment of herd books.

Mr. Davison raised the question of the milk records of cows as apart from milk records of breed.

Mr. Higginbottom pointed out the immense importance of the official recognition of milk records, as without such they could carry little value and would not be regarded as authentic.

Colonel Walker stated that he thought milk testing and recording should be done by Local Governments. Mr. Smith agreed.

Colonel Matson, however, pointed out that there must be a central authority to deal with the breed records, as breeds were not limited to provincial boundaries nor would they adhere to such. The importance of inaugurating a standardized system of milk recording and of providing the necessary authority to certify such records was emphasized by the Conference.

The President suggested and the Conference agreed that the proposed Central Bureau should undertake this.

As comparatively few cattle are exported from India to foreign countries, the granting of health certificates is one which principally applies to the movement of animals within the Indian Empire, and as the question of health certificates primarily concerns the Veterinary Department, the Conference recommended that it should be considered at the next Veterinary Conference which should define the qualifications necessary for persons authorized to grant such certificates. Health certificates

A discussion arose regarding disposal of animals from the military dairy farms and from Pusa, and it was agreed from the facts brought to light that the Bureau should act as a clearing-house for information regarding sales, etc.

In dealing with II (c), Sirdar Darshan Singh detailed at length a scheme submitted by him to his Government whereby landholders in the Punjab would be given special concessions in the direction of remission of water rate or land revenue or both, in order to induce them to grow more fodder crops and maintain more cattle on their lands. The fodder crops recommended to be catch crops entirely additional to those now grown. Fodder crops.

Mr. Parr stated that in the United Provinces concessions of this kind had been given by the canal authorities for growing lucerne, but these had not been of great value owing to intermittent supply of water.

The President suggested that in the first instance such concessions might be given on an experimental scale to see whether Sirdar Darshan Singh's contention that the total revenue would not be lowered worked out in practice. The Conference agreed to this.

The President asked Mr. Z. R. Kothavala, Dairy Superintendent, Bombay Municipality, to explain the position regarding the milk supply of that city as stated in his note.

Mr. Kothavala reviewed the significance of the figures given in support of his written statement (p. 50).

The Conference considered that the foregoing expressed their recommendations regarding subjects (a), (b), (c), (d) and (g) of the provisional programme submitted to them. The Conference regretted that it was unable, owing to want of time, to deal with subjects (f), (h) and (i).

APPENDIX I.

The Imperial Institute of Animal Husbandry and Dairying.

(a)

(W. SMITH, *Imperial Dairy Expert.*)

It was originally proposed that two courses should be simultaneously inaugurated at the Imperial Institute of Animal Husbandry and Dairying, Bangalore: one for agricultural graduates who had served two years in the Provincial Agricultural Service and the other for dairy managers. There have been very few applicants for the former course and both courses will commence on January 1st. For the dairy diploma course the full number of pupils which the farm can accommodate (12) have been enrolled and many more suitable men who applied were referred to the Allahabad Agricultural Institute who are also teaching for this, the Indian Diploma in Dairying to be awarded by the Institute. The awarding of this diploma by the Imperial Institute of Animal Husbandry and Dairying to pupils of any agricultural college or institute which has the requisite facilities and staff for teaching practical and scientific dairying has been sanctioned by Government.

The proposed curriculum and conditions for entry for this diploma course are attached hereto (Annexures I and II) and suggestions will be welcomed as to altering or extending this syllabus for future courses.

In addition to the teaching of pupils who wish to take the Indian Diploma in Dairying, the Institute in accordance with an arrangement made with the Military Department will from 1925 undertake the training of some 8 to 10 military dairy farm managers yearly, but the training of these two classes of dairy farm managers will not fully fulfil the purpose for which the Institute has been established, and the following suggestions as to how it could be further utilized by Local Governments and Indian States are put forward:—

- (1) The carrying out of feeding experiments either for or contemporary with Provincial or State Agricultural Departments.
- (2) The testing of the digestibility of cattle feeds.
- (3) The investigation of technical dairy problems, either scientific or practical of any sort which Local Governments or Indian States may find themselves confronted with and which may be considered problems of national importance.
- (4) The giving of short special courses for college students or others from provincial or State colleges who wish to specialize in any particular dairy problem such as: (a) Urban milk supply, (b) Cheese making, (c) Casein manufacture, (d) Ghee production, (e) Butter making, (f) Dairy refrigeration and transport of dairy produce.
- (5) Failing the establishment of the Central Cattle Board by the Government of India, acting temporarily as an authority for testing and issuing milk record certificates for pedigreed milking herds in any part of the country.
- (6) Providing material and facilities generally for the Veterinary Departments of Local Governments and States in the direction of experiment in research work in connection with the prevention and treatment of diseases of dairy cattle.
- (7) Testing and reporting to all Local Governments and States on new makes of dairy machines, implements or processes.
- (8) Publishing from time to time bulletins relating to technical and scientific dairying.

ANNEXURE I.

Government communiqué.

The Government of India have decided in connection with the working of the Imperial Institute of Animal Husbandry and Dairying at Bangalore to institute an Indian Diploma in Dairying on the lines of the British National Diploma in Dairying, to be granted to persons who have successfully completed a course of not less than two years' instruction at an institute

recognized by the Imperial Institute as capable of teaching upto a standard required for such diploma.

It is hoped that sooner or later agricultural colleges in India will possess the necessary staff and equipment and will be willing to train pupils for this diploma, but for the present the necessary course of instruction will be commenced on January 1st, 1924, at the Imperial Institute of Animal Husbandry and Dairying, Bangalore, where eight selected pupils will be taken. The course will last for two years with two months' vacation each year, holiday period will be the months of April and May.

The course will consist of practical and scientific training in the principles of cattle breeding, cattle feeding and management, dairy farm management, Indian and foreign breeds of dairy cattle, stock judging, diseases of dairy cattle, dairy farm buildings, milk production, handling and sale, butter and ghee manufacture, dairy chemistry, dairy bacteriology and dairy farm book keeping. Ample scope is available for practical and laboratory work at Bangalore.

Practical instruction will be under the direction of the Imperial Dairy Expert and the scientific training will be carried out under the control of Physiological Chemist to the Government of India.

Students must be of good character and over 17 years of age. The minimum educational qualification necessary for admission is Matriculation or the School Final Examination, but in special cases the Imperial Dairy Expert will have power to waive this condition.

Applications for admission should be addressed to the Imperial Dairy Expert, Bangalore, to reach before the 1st December, 1923.

A tuition fee of Rs. 15 will be charged for each student for each month or part of a month he is actually in residence at the Institute. Accommodation will be provided free of charge which pupils must avail themselves of. No stipends will be paid to students and all travelling expenses must be borne by students themselves.

At close of the course an examination will be held for those students who have satisfactorily completed the course of instruction and the Indian Diploma in Dairying will be awarded by the Imperial Institute of Animal Husbandry and Dairying to the successful candidates.

ANNEXURE II.

Syllabus of studies for dairy manager's course.

Animal Husbandry.

I. PRINCIPLES OF BREEDING :—Heredity, Selection, Influence of sire and dam. Breeding systems, Mendelism.

II. FEEDS AND FEEDING :—Functions of food, Food nutrients, Digestion of food, Food requirements, Feeding standards including balanced rations, Indian feeding stuffs.

III. DAIRY FARM MANAGEMENT :—Cultivation of special fodder crops for dairy cattle feed Irrigation, Rotation of crops, Dairy farm buildings (cattle sheds, godowns, calf pens, silos, milk recording rooms, and purely farm buildings).

IV. DAIRY CATTLE :—Indian breeds of milch cows, Foreign breeds of milch cows, Indian breeds of milch buffaloes, Draught cattle (bullocks and buffaloes), The dual-purpose animal, Calf rearing.

V. STOCK JUDGING :—Handling and examination of the living animals to estimate age, milking qualities, draught qualities, value, etc.

VI. DISEASES OF DAIRY CATTLE :—Signs of health and disease, Treatment of wounds and minor troubles, Contagious diseases, Prevention of disease.

Dairying.

I. DAIRY BUILDINGS :—Manager's residence, Dairy factory buildings, City dairies, Farm dairies, Drainage, ventilation, and sanitation of dairy buildings.

II. MILK PRODUCTION, HANDLING AND SALE :—Milking by hand, Milking by machine, Recording of milk yields, Milk pasteurising by different methods, Milk cooling, Milk bottling and distribution, Cold storage and rail transport of milk, Marketing dairy produce.

III. BUTTER AND GHEE MANUFACTURE :—Separation of milk by hand and power machines; Treatment of cream for butter making; Churning by hand and power, Working, salting, and making up, packing, cold storage, and transport of butter; Ghee manufacture, packing and transport.

IV. CHEESE MANUFACTURE :—Manufacture of Cheddar cheese, Curing hard cheese in cold storage, Manufacture and ripening of soft cheese.

V. UTILIZATION OF DAIRY BY-PRODUCTS :—Casein manufacture, Whey butter, Dried and condensed milk, etc.

VI. DAIRY CHEMISTRY :—Testing of new milk, separated milk, butter milk and whey by Gerber or Babcock and quantitative methods; Testing of butter, cheese and ghee for fat contents, moisture, salt, etc., etc.; Detection of preservatives in milk and dairy products; Detection of adulterants in milk and dairy products; Analysis of feeding stuffs and detection of adulteration of feeding stuffs.

VII. DAIRY BACTERIOLOGY :—Principles of cleanliness; Estimation of bacterial contents of dairy products, air and water; Preparation of pure cultures for cream ripening and cheese manufacture.

VIII. DAIRY AND FARM ENGINEERING :—Cultivating and harvesting implements and machines; Prime movers, steam boilers, steam engines, internal combustion engines and electric motors; Pumps and water raising apparatus; Farm yard machines, silage cutters, grinding mills,

Dairy machinery :—Pasteurisers, milk pumps, coolers, cream separators, churns, butter-workers, milk sterilizing plant, ghee boiling plant, milk testers.

Refrigerating machinery :—Principles of mechanical refrigeration, compressors, condensers, evaporators, ice making systems, construction of cold storage rooms.

Milk delivery vehicles :—Their construction and maintenance.

IX. BOOK-KEEPING AND RECORDS :—Milk records, animal history records, pedigree records. Cultivation registers, commercial dairy book-keeping including preparation of trading accounts, balance sheets and costing systems.

(b)

(SAM HIGGINBOTTOM, M.A., B.Sc., *Principal, Allahabad Agricultural Institute.*)

I consider the course covers the ground very well. My idea of it is that if the men who take it are going to be sent out at the end of their training to set up dairies for Provincial Governments or Indian States then I think the students are too young, and time should be lengthened by one year. If every student passing out from this course could have at least two years in one of the Government military or other commercial dairies then possibly he would be fit to take up work and manage a dairy under a Provincial Government or Indian State.

Under any consideration, I would favour the course being lengthened to three years and the age for those admitted being raised to eighteen. The students who will come will have to undergo such a revolution in their thinking, their manner of living, that the first year will be very largely one of re-adjustment to these unusual conditions. There will be so much practical work which will be done at hours not recognized by the ordinary Indian students as the legitimate hours for study. By that I mean their having to get up early in the morning to feed the cattle, the staying up late at night with a cow about to calve, the milking at hours in the night in order to get the milk out for early morning. These things are so different from what the students have been used to that the first year will largely be occupied with a change of mental attitude and my experience is that it is very difficult to hasten this process.

Again, if the student is to be in charge of a dairy after getting through his course, great responsibility will be laid upon him, and I doubt whether two years' time will be sufficient for development in accepting responsibility. A boy who starts in at eighteen and passes out at twenty-one seems to have a greater chance of success than a boy who starts in at seventeen and passes out at nineteen.

One important matter is not down under this subject but it seems to me to bear on the success of dairying, and that is the training of the ordinary Indian *girdala*. At present he seems to do everything possible to prevent a dairy from being successful. Their honesty could be improved, their sense of responsibility deepened. They are not happy when the calves are taken away from the cows. They do everything they can to prove that the cow will not give milk unless the calf sucks it. In spite of much teaching, they milk with dirty wet hands. Very few of them will milk a cow entirely dry, and experience shows that few things will dry a cow quicker than being incompletely milked. I would like a discussion as to the best way to convert the ordinary *girdala* to what we recognize is for the economic well-being of the dairy industry in India.

APPENDIX II.

The best means of utilizing the Imperial dairy farms for the good of India as a whole.

(a)

(G. S. HENDERSON, N.D.A., N.D.D., *Imperial Agriculturist.*)

The Pusa herd has been in existence since 1904 and consists of pure bred Saniwal cattle and a cross-bred herd formed by crossing the rejected Saniwal cows with Ayrshire bulls.

The herd numbers about 400 head and the non-experimental area of the Pusa farm is cropped with a rotation designed to supply the total grain and fodder required by the cattle. The herd is consequently self-supporting, and as more waste land is being gradually levelled and irrigated the numbers of the herd will be capable of considerable expansion.

This farm is thus on a different basis from the other farms mentioned, as no attempt is made to handle the milk. The milk is sold direct from the cows. A good local market is being built up, and it is expected to work up to a sale of Rs. 100/- per day, besides the supply of the Pusa Institute. This would give a return of Rs. 40,000/- for sale of milk and Rs. 10,000/- for sale of surplus stock or Rs. 50,000/- with a budget expenditure of about Rs. 50,000/- for supplies and services for the whole Agricultural Section at Pusa.

The Pusa farm consequently forms a self-contained demonstration such as could be followed by a zemindar without any considerable outlay in machinery and buildings necessary to handle milk.

The increase in the average milk yield per cow in 10 years is as follows:—

Year	lb. per head per cow
1913	5.8
1914	7.5
1915	8.3
1916	6.6
1917	7.6
1918	7.2
1919	8.7
1920	10.6
1921	10.7
1922	12.0

During the last 10 years the following young breeding stock with a milk pedigree of 3—4 generations behind them, have been sent to the following provinces in India:—

Bihar, 409; Central Provinces, 40; United Provinces, 19; Punjab, 3; Assam, 7; Bengal, 23; Burma, 0; Hyderabad State, 13; Madras, 7; Travancore State, 6; Military Dairy Farms, 6; Foreign Governments, 17; Number of animals sold, 561.

The results being obtained on the Pusa farm in regard to fodder crops, rotations and upkeep of fertility, must prove of considerable value. The annual outturn from an area of 400 acres at Pusa has doubled in 10 years.

In view of the above facts, I would suggest that the best method of utilizing the Pusa farm is to allow it to expand on the lines on which it is at present working.

(b)

(S. T. D. WALLACE, V.C., B.Sc., *Deputy Director of Agriculture in charge of Animal Husbandry, Central Provinces.*)

There is an increasing demand in the Central Provinces and Berar for cows and bulls of milking breeds such as the Sahiwal or Montgomery breed. During the last three years a herd of this breed has been established on the Telinkheri dairy farm, Nagpur.

The herd contains at present about 30 cows, and it is not expected that a herd of more than 35 to 40 cows with young stock can be maintained on the farm; moreover, it will be several years before the standard of this herd can be raised to the standards of the herds at such centres as Ferozepore, Karnal and Pusa.

As the Telinkheri herd is still in the early stages of development, it follows that for some years to come the female stock which we have available for disposal to the public will either belong to the aged or draft class or animals of a young age which cannot be considered first class. The quality of the bulls will only improve as the quality of the breeding herd improves.

If we are limited to the surplus which can be sold off this single farm (in the event of another farm being opened under present conditions the stock would have to be built up from the surplus from the Telinkheri farm), then the introduction of an improved milking strain into the Central Provinces and Berar will be a very slow process.

The general public will, therefore, have to obtain a considerable portion of the animals they require from the longer established herds at such centres as Ferozepore, Karnal and Pusa. One of the great obstacles in the way of importing cattle from these centres into this part of India is the high railway freight and the long time occupied on the journey; if wagons are attached to passenger trains the freight charge is still further increased.

- (1) I, therefore, consider that one of the most important factors in utilizing the herds at Pusa, Bangalore, Wellington, Karnal and other centres is the granting of special facilities for the conveyance of stock from these farms by rail at special rates. It is desirable that rates on all classes of live-stock should be reduced, but if that is not possible a special concession should be made for pedigree stock conveyed from these Government farms to other parts of India. Such consignments of cattle should be conveyed by passenger trains at a special concession rate which should be below the ordinary goods traffic rate.
- (2) Before surplus stock is sold by auction a reasonable upset price should be fixed and lists showing pedigree and upset price circulated to the Directors of Agriculture in each province, who should then be asked to state if they wish to have any of the animals shown on the list at the fixed price stated. This arrangement only to hold good in cases where the cattle are to remain in the possession of the Local Government.
- (3) As it is often difficult to get money included in a budget for the purchase of pedigree stock, it is desirable that some form of book transfer should be employed which would do away with the necessity of providing money or the obtaining of special sanction from the Local Government. In other words, cattle required from one of the farms should be transferred to the Local Government and the amount of the upset price credited to the farm concerned from the revenues of the Central Government. Presumably the farms mentioned are to be maintained very largely out of revenues contributed directly or indirectly by the various Local Governments to the Central Government.

(c)

(SAM HIGGINBOTTOM, M.A., B.Sc., *Principal, Allahabad Agricultural Institute.*)

I regard cattlebreeding farms in India, managed and financed by the State, with a well worked out programme which will be strictly adhered to until completed, as being one of the most important factors in bringing economic success to the dairy industry in India. Not five per cent. of the cows of India to-day pay their way. The Government military farm at Ferozepore shows what can be done by the careful selection of animals of a recognized Indian milking breed, and the breeding up and ruthless culling of animals falling below a certain standard.

All the recognized dairy breeds of India should be given a fair trial as has been done at Ferozepore with one breed. In addition to this, I believe that all the recognized dairy breeds of Europe should be tried out by crossing females of Hissar, Kosi, Montgomery, Saniwal, Sindhi, and other Indian breeds with Friesian, Milking Shorthorns, Brown Swiss, Ayrshire, Guernsey, Jersey, etc., and the records carefully kept for a number of years. I think it can be assumed by now that the opinion of the men best qualified to judge in India has settled down to the desirability of the dual-purpose type, and not the dual purpose we speak of in America and England where milk and meat are required, but the dual purpose of milk production and draught. The dual purpose of milk and beef seems mutually contradictory. The dual purpose of milk and draught is ideal; the big boned, big framed, big girthed ox to pull a plough and the female of the same type with ample capacity to handle feed and to turn it into milk. It would not be possible at any one farm to undertake the crossing of all these breeds, but I believe a distribution to different farms could be made and a programme adhered to for at least ten years and then we would have something certain to go upon that would be of saving to the whole of India. We would know then which of these crosses would have the necessary ability to stand the diseases and climate of India and yet to be economical producers of milk and draught. At Allahabad we would undertake to stick to a programme. We have Sindhi and Ferozepore cattle and could undertake to provide American Friesian and Jersey bulls.

It seems also fundamental to establish regular herds of the Indian pure breeds and have a herd book and to have auctions at stated intervals when really first class animals would be sold out of these herds. The best cattle to-day are undoubtedly in the Government military dairies but it is not usually possible to buy any of the good ones from them, that is, if a good cow is sold it is usually because of some blemish, there is some reason why the Government military dairies are willing to part with her, so that it is almost impossible for a private individual to get a foundation for a herd of good cattle. If the public knew that they could get really good cattle for a foundation herd I believe there is enough pride and ambition in many of the Indian zemindars and wealthy men to establish breeding farms of their own.

Furthermore, it would be necessary to arrange for an exchange or circulation of the bulls to prevent too much inbreeding, and also to find out the bulls of outstanding merit. A bull in India is usually getting on in years before his daughters come into milking and where bulls of outstanding merit are discovered they need special treatment and mating with selected females. If this were done for a few years the standard would be very much raised.

APPENDIX III.

Improvement of cattle by better breeding and feeding.

(a)

E. J. BRUCE *Deputy Director of Agriculture for Animal Breeding, Bombay.*

In the Bombay Presidency there are several breeds which have been fairly pure. Each one of these breeds has been bred to suit the particular condition of the tract in which it is found; for instance, the big-framed, long-legged Kankrej is particularly suited to the sandy, depopulated, so-called roads of Gujarat. The Dangli, a small compact breed bred in the Western Ghats, is particularly useful in the stony region with a heavy rainfall. This breed is in all probability the only breed in India which will work in wet rice lands—the buffalo excepted.

Each one of these pure breeds has been bred by a professional breeder. This breeder in the past has been in the habit of leaving his home with the cattle just after Dipavali. He grazed his cattle wherever the conditions were most favourable, travelling for hundreds of miles away from his home often in very dense forests and returning home just again before Dipavali, when he disposed of any saleable young stock males. In itinerating from place to place, the variety of grazing his cattle received was in all probability, a sufficiently nutritious ration to keep his stock in thriving condition. Disease was practically unknown as the sick, lame, etc., were usually left behind, to be devoured by wild animals. In this manner it was a case of the survival of the fittest and his breeding was conducted by selection of the fittest. He was, therefore, able to maintain a fair standard.

Stud bulls were obtained by mutual exchange; no money being paid, he felt it cost him nothing. The extra male progeny being left at home or sold to a cattle or a bullock raiser, there was no fear of indiscriminate breeding as the only bull with the herd was the herd bull, which the breeder selected.

To-day owing to restrictions in forests, the bringing under cultivation of grazing lands, the paying of fees to graze cattle in different localities has restricted this breeder to a particular locality, and owing to the unprofitable business this breeder has now to remain more or less stationary as he has to supplement his income derived from cattle by other operations. This has led to indiscriminate breeding as the bulls and cows must remain together. Disease is spread and remains in a herd; the restricted grazing does not provide the necessary variety and hence the rapid deterioration.

It will be seen that by the above methods cattle were raised very cheaply and a fairly good standard maintained. These conditions having altered considerably within the last few years, it is necessary for some very substantial steps to be taken in substitution of the above, which will at the same time not raise the price of cattle, especially bullocks, to enable the cultivator obtain his necessary draught cattle at a price that will not hinder him carrying on his work.

To obtain these conditions the primary essentials are cheap food and fodder, combined with the raising of good pure-bred stud bulls, the better control of disease and the introduction of castration on a wholesale scale.

Suggestions for improvement

In the Bombay Presidency each pure breed is practically restricted to 4 or 5 taluqs where professional breeders raise cattle. These areas are as a general rule not in a very good state of cultivation and there is a fair amount of land available for grazing, hay and silage-making. The raising of stud bulls must fall on Government, as under altered conditions it is practically impossible for the cattle breeder to produce a really sound good, pure-bred bull. Government cannot be expected, however, to raise sufficient bulls to meet the requirements of the whole country; but it is possible to situate a stock farm in the centre of breeding of each breed. Thus each stock farm would be required to produce the necessary bulls for 4 or 5 taluqs.

The farm manager would control these 4 or 5 taluqs, a register or herd book being maintained on the farm of all pure bred cows in these taluqs and in time this whole area would be more or less pure and improved. The farm manager would also improve grass lands, teach

and encourage storage of fodder in the form of hay or silage, the grass lands in these areas being let on as reasonable terms as possible.

The annual cattle show, where substantial prizes would be given, would help considerably in improvement.

(b)

(R. W. LITTLEWOOD, N.D.A., Deputy Director of Agriculture for Live-stock, Madras.)

Cross-breeding experiments. Cross-breeding with Ayrshire, Sindhi and Saniwal cattle which was commenced at the Bangalore Military Dairy four years ago has now been transferred to the College Dairy at Coimbatore. Thirty-two cross-bred cows and heifers born in the experiment were purchased from the Military Dairy in January 1923. Four of these animals died within four months of arrival at Coimbatore, two of the casualties being due to red water.

Cross-breeding is now being continued by using F₁ and F₂ generation bulls on the above stock. F₁ generation heifers are a very promising lot as regards colour and size. The milk yield of F₂ generation taking them as a whole are far better than their dams.

One F₂ generation heifer has calved at the age of 1 year and 11 months. Five others are in calf.

The number of cows and heifers in the college herd now is	50
The number of cross-bred bulls are	18

The cross-bred bulls are being used also for working purposes on the farm, till the results of their services can be seen.

The daily average milk yield of the college herd has now risen to 15 lb a day, and in 1912 the daily average was 4.5 lb. a day.

Cross-breeding is being carried on in different parts of the presidency and advice is given by this section as regards feeding and rearing. A cross-bred herd was purchased from Kirkee Military Dairy for the Central Jail, Vellore, and a cross-bred bull from this department has been loaned to the jail authorities.

Two planters have taken up cross-breeding in this presidency, and have purchased Ayrshire bulls.

Madras milk supply. Six cross-bred bulls and three buffalo bulls are at stud in Madras. These animals took the place of the Ayrshire bulls imported in 1920. Four hundred and ninety-nine services have been performed by the cross-bred bulls and 377 by buffalo bulls. Most of the calves born have been inspected by the staff of the writer. There were quite a number of other births to the animals, but the animals could not be traced as the mothers were sold after they had gone dry. The Agricultural Demonstrator, Madras, advises the milkmen on the feeding and rearing of calves, but the milkmen do not pay much attention to his advice. In the majority of cases the calf is only half fed.

The Government this year, on my recommendation, have sanctioned a sum of Rs. 250 to be given away as prizes at the S. P. C. A. Show this year for the best-cared-for calves owned by professional milkmen and born to our cross-bred bulls. The news has been well received by the milkmen and they are now paying more attention to the feeding of their calves.

Ootacamund hill station. The one surviving Ayrshire bull has been at stud in this hill station a year and has got some very good calves. There are a large number of European and Indian gentlemen in this hill station who own Australian, Ayrshire, Jersey and cross-bred cows and the placing of the Ayrshire bull in this station is very much appreciated by the dairy people.

Coimbatore dairy. Besides the cross-breeding which is being carried on on this farm, there are also a Sindhi herd and a Montgomery herd. The Sindhi herd consists of—

Cows and heifers	
Bulls	

Two of the Sindhi cows have yielded over 6,500 lb. in a lactation and the two bull calves born to these cows are ready for service, and it is hoped to obtain some very good young stock from these bulls.

The Montgomeries purchased from Pusa are not a success. Out of the five purchased, only one has calved during the last 18 months. The other four are all in calf now and they have been dry for too long to be at all profitable on the dairy farm.

Ongole Cattle Farm, Chintaladevi. The Ongole Cattle Farm, Chintaladevi, is now in its fifth year. Two years ago enquiries were made all over the tract for a good breeding bull for the farm but it was impossible to procure the right kind of bull; and so we had to continue with the bulls which were purchased at the beginning of the farm. There are now three very good young bulls which have been reared on the farm and these animals will be kept for breeding purposes. There are 22 bulls over two years old which I intend to sell in Ongole in the month of February 1924. Two Ongole bulls have been put at stud on experimental stations and a small herd of one bull and five heifers sold to a Raja as a nucleus herd.

It is also hoped to supply the experimental stations with work animals bred on this farm.

The herd has been thinned out and all bad breeding cows have been disposed of. The number of cattle on the farm at present is—

Cows	41
Heifers over one year	23
Bulls over one year	26
Calves under one year	32
Breeding Bulls	4

Kangayam herd. As funds are not available for the Kangayam farm, the Kangayam herd from Coimbatore was transferred to Chintaladevi 18 months ago.

Five young bulls have been transferred to Coimbatore for stud and sale purposes. The herd now consists of—

Cows and heifers	8
Bull	1
Calves under one year	6

Buffaloes. The Buffalo Breeding Station which was commenced about five years ago at Samalkot did not produce the desired result. It was thought that by purchasing good buffalo bull calves from selected dams, and by good feeding, we could obtain a few good breeding bulls. After rearing these animals to the age of three years, I tried to sell them to ryots requiring buffalo bulls, but they all refused to purchase as they were not big enough for the purpose. The three best bulls were kept for breeding purposes in Madras and the remainder sold in the district for work animals.]

A farm has now been commenced at Guntur and it is intended to breed a cross-bred Delhi country buffalo which will produce larger animals and also tend to increase the milk yield. For this purpose the Delhi buffalo bull has been used on the country she-buffalo. I am now working with the first cross.

Bulls of the Kangayam and Ongole breeds are at stud at most of the experimental stations, also Delhi buffalo and country buffalo bulls are at stud.

Premiums. Five premiums of hundred rupees each have been granted to societies and private owners towards the maintenance of breeding bulls in various districts.

Feeding. Minor experiments have been conducted on milch cows by substituting different cakes, including rice meal, in the ration and silage compound to green grass. The new Assistant Agricultural Chemist is undertaking feeding experiments at the Central Farm, Coimbatore, to find out the digestive co-efficient.

(0)

(T. F. QUIRKE, M.R.C.V.S., Chief Superintendent, Civil Veterinary Department, Punjab.)

In a previous note submitted at the last Board of Agriculture held in Pusa, 1922, the results of the cattle census held in 1919-20 were reviewed which disclosed a diminution amounting to 1.9 millions in the cattle population of the Punjab since 1914. This diminution was ascribed principally to epidemics of diseases and fodder famines which are the worst of very serious

mortality, also that for various economic reasons zemindars were keeping less cattle for breeding purposes than formerly. It was noted that there was no need for pessimism as to the actual numbers of cattle which were, we considered, more than sufficient for the normal carrying capacity of the country, provided proper steps were taken by means of more careful breeding and tending to raise the general standard of efficiency of our animals.

The results of the last census held in 1923 have only recently been published; these may suitably be considered from the following abstract prepared by the Director of Land Records Punjab, which enables an effective comparison to be made between the various classes of stock, for the different census years:—

Year	(MILLIONS)							
	Cows	Cow buffaloes	Bulls and bullocks	Male buffaloes	Young stock	Total cattle	Sheep	Goats
1904	3.0	1.0	4.1	0.6	3.7	13.3	4.1	5.5
1909	3.1	2.2	4.2	0.6	3.8	14.2	4.0	4.2
1914	3.7	2.6	4.6	0.8	4.0	15.5	4.7	4.4
1920	2.7	2.4	3.0	0.4	4.0	14.3	4.0	3.1
Corrected	3.0	2.7	4.3	0.5	3.8
1923	3.0	2.8	4.1	0.4	5.1	14.0	4.1	4.3
Corrected	3.0	2.5	4.6	0.5	4.0

One notes that since 1920 there has been a very appreciable increase in the total number of cattle, sufficient to allay the fears of those economists whose policy it has been to represent the cattle-breeding situation in terms of quantity rather than quality. There has also been a notable increase in the number of bulls and bullocks, the latter indicating a sufficiency of plough cattle for the cultivation of the land. There would, therefore, appear to be no cause for alarm as to the actual numbers of cattle if it could be assumed that the quality was up to the standard required.

Before considering the general question of cattle improvement it is well to consider what are the main causes underlying the very apparent apathy of the ordinary zemindar in adopting a rational system of breeding, in other words, we need to consider the question from the zemindar's point of view. We see from the reports of co-operative societies of the enormous losses sustained by Punjab zemindars on account of cattle mortality. In 1910-20 out of 173,763 members more than 25,000 had to borrow over 16 lakhs of rupees to replace cattle; in 1920-21, over 18 lakhs; in 1921-22, nearly 16 lakhs; whilst in, 1922-23, 13 lakhs were borrowed for this purpose.

It seems a reasonable proposal, therefore, from the zemindars of this province that the first essential to progress in cattle breeding is to ensure as much protection as possible against contagious disease, that they may not have to suffer the expense of losing animals which will afterwards fall victims to contagious diseases. In an agricultural country like India, where the mainstay of the zemindar is his live stock, the necessity for a properly organized Veterinary Department is paramount. In this province the necessity for strengthening the staff of the Civil Veterinary Department has long since been recognized; in fact, the Punjab has for many years enjoyed the reputation for being the premier province in India as regards veterinary organization. The province for the purpose of veterinary administration is divided into three Circles, the North, South and Central Circles, each in charge of a Superintendent with a Deputy Superintendent under him. The subordinate staff comprises 27 Veterinary Inspectors and 213 Veterinary Assistants. It is hoped that in time each division will have its own Deputy Superintendent, each district its own Veterinary Inspector and each taluk its own Veterinary Assistant. We must, however, point out that, even with an unlimited staff at our disposal, little headway is possible against contagious diseases in this country unless we can exercise powers to control the movement of diseased animals and to take other necessary effective measures for the control of outbreaks. We consider this a sufficient reply to criticism occasionally made on the

work of this department with regard to contagious diseases which we grant in the presence of a Veterinary Department continues to exact a heavy toll on the animal population of the province, for the reason that in the absence of suitable legislation it has no powers to deal effectively with contagious disease in this country.

It should be quite clear then that even the most progressive cattle breeding policy is justified by this department cannot hope to succeed which attempts to ignore the necessity for such protection. It is to be hoped therefore that zemin-dars will soon recognize the need for more thorough measures being adopted against the heavy mortality from contagious diseases which is largely preventable. The Financial Commissioner, Sir P. Faran, in reviewing the work of the co-operative societies in the Punjab for 1919-20, noted as follows:—

"Over 16 lakhs, nearly one quarter of the whole sum lent, were advanced for replacement of cattle. This last item clearly demonstrates the enormous burden borne by the cultivating classes on account of high cattle mortality and leaves no room for doubt that much greater veterinary assistance is needed than is available now."

In reviewing the work of this department for 1921-22, the Financial Commissioner, Mr. E. H. Abbott, noted as follows on the Punjab cattle breeding in letters: "It is desirable both to arouse a desire for improvement and to provide facilities for gratifying the desire as an aim. To secure any general co-operation in cattle breeding it has first to be brought home to the cattle owner that it pays to keep a good rather than a bad animal. Zemin-dars are far from concerned of this at present owing to the mortality from contagious diseases and from starvation. Veterinary knowledge can assist to remove the former cause but for the latter measures to secure a supply of fodder in famine seasons are necessary. But here again the difficulty arises that the expense of fodder is greater than the animals are worth. Fewer animals of better quality, though costing no more to feed, would give the same amount of draught power and of milk. Towards improvement therefore, the first step necessary appears to be a recognition that at any rate in the poorer tracts which suffer from famines a restriction of numbers together with fodder storage must precede any general improvement of breed."

The success which has so far been achieved in cattle breeding has been entirely due to the efforts of a small but keen band of workers of the Civil Veterinary Department. This success has been the outcome of the very close contact which the department maintains with the zemin-dars of this province, a policy which the late Colonel Farquhar has been mainly responsible in impressing on the staff. There exists throughout the province a network of veterinary hospitals now numbering 178, each in charge of a Veterinary Assistant to whom is assigned the veterinary supervision of a certain number of thanas with an Inspector in control in each district. The Punjab can boast of having the premier cattle breeding station in India, namely, the Government Cattle Farm, Hissar, which is in charge of a Superintendent. The area of the farm is roughly 42,000 acres. About half this area produces in good years fine crops of sorghum, which permits of good grazing and at the same time allows for ten to twenty thousand acres of good hay to be collected as a fallow reserve. The farm, being situated at the tail of the Western Jumna Canal, does not get a very liberal supply of water for irrigation purposes; however, on an average about 1,600 acres are irrigated and cultivated annually. The number of live stock on the farm amounted to 5,573 on 31st March, 1921. An increase of the breeding operations carried on may be gathered from the fact that there are on an average 1,651 births on the farm each year. At the annual distribution of bulls, which is held in November each year on the farm, attended by representatives from the various District Boards, up to 275 bulls are available as District Board stall bulls for the districts. There are now over 1,700 Hissar bulls at stud in the province (all of which are specially selected animals with known pedigrees) compared with 637 in 1914, and the demand is steadily increasing. These are being bred and afterwards distributed in the districts with the primary object of breeding plough bullocks, fit to take their place in the agricultural development of the province. That these are the best procurable and are suited to zemin-dar requirements is evident from the popularity which they have gained in the districts. That these progenies are superior to the village type is evident to any one who has visited the villages where these District Board bulls are at work, and to those who keep their eyes open at fairs throughout the province wherever District Board produce are exhibited. It is a matter of general knowledge that the prices zemin-dars can realize for the progeny of District Board bulls in the open market are far higher than for the ordinary village type. This is why even as a financial proposition it should pay District Boards to invest more money in the encouragement of cattle breeding, as with a properly organized system of cattle fairs as in other countries they can recoup themselves out of the increased revenue from the sale of these animals.

The Civil Veterinary Department depends entirely for the maintenance of the bull power of the province on private help from zemin-dars aided by District Boards when their resources permit of expenditure under this heading. Unfortunately District Board funds are not always very flourishing, whilst the demands made on them for objects which are popularly supposed to be more important than cattle breeding are steadily on the increase, with the result that

there is little to spare for cattle breeding : and what financial help is granted for the purpose is often won after a very hard struggle. It will be understood therefore why the department is obliged to pursue the encouragement of cattle breeding on such cheap lines, and at the same time one can recognize the difficulties which for this reason are met with in popularizing cattle breeding.

Through want of financial help we are constantly in the position of having to refuse very desirable applicants for bulls notwithstanding that they are prepared to pay part of their cost without any further liability to the District Board once they are issued. The idea is fortunately gaining ground amongst zamindars that District Boards as dispensers of the district funds should come more to their assistance in the purchase of stud bulls. It would appear, however, that, owing to the inordinate demands of education and medical relief, the zamindar members of the Boards are powerless when it comes to securing a fair proportion of the District Board funds for that purely zamindari object—the encouragement of cattle breeding. As the department is responsible for the promotion of cattle breeding in this province, we are not satisfied with the present precarious system of securing financial help and would welcome a fixed contribution out of the District Board funds in accordance with the resources of the different districts together with a yearly subsidy from Government to meet special requirements. Provided sufficient funds were placed at our disposal, we would be in a position to guarantee to make good all casualties, to replace more quickly than at present bulls which had passed their prime and to ensure that in the villages there would be continuity of results by having all stud bulls regularly replaced.

That a distinct advance has been made through the persistent efforts of the department is evident from the record number of bulls which have been indented for this year, namely, 256 compared with 171 in 1914, the majority of which have been supplied to zamindars who have paid half the cost, the remainder of the price being found by the District Board. The liability of the District Board ceases when the bulls have been supplied, as under the present system the feeding charges of all District Board bulls are borne either by the zamindar, who has accepted the bull, or generally by the inhabitants of the village in which the bull is located. With the very limited funds allotted to cattle breeding we cannot afford to entertain any expensive system of bull stands and wisely in our opinion are devoting all available funds in the actual purchase of bulls.

The District Board bulls in the majority of cases are allowed to wander at large with the village herds and on the whole are well cared for, more especially in those districts where fodder is plentiful. One must realize that it requires a certain amount of public spirit for the ordinary zamindar to accept the responsibility and expense of the feed and keep of a District Board bull for the benefit of his neighbours' cattle, and that so many are forthcoming to undertake this is a very encouraging feature of cattle breeding in this province and makes one feel that the department's efforts in the cause are being appreciated. What however is most essential is, that there must be a steady flow of approved bulls into the districts maintained for many years to come, and to ensure this the necessary steps should be taken.

It will be understood therefore that to hasten the progress of cattle breeding in the province it will be necessary to largely increase the number of District Board bulls which find their way into the districts annually. For some years to come we have to contro our hopes for the improvement of the breed of cattle on the number of approved bulls at work in the province ; these are all specially selected animals, the history of whose antecedents is well known. The progeny of these animals will be a guarantee that we can expect them to breed animals of their own type so that we are spared the uncertainty of breeding from animals the history of which is unknown to us. It is hoped that in course of time, when these District Board bulls have left their mark on the cattle of the province, more reliance can be placed on the village profluct ; meanwhile we must rigorously place our faith on these approved bulls.

In these days of financial stringency there is a tendency on the part of some District Boards to overestimate the value of the comparatively small number of approved bulls now working in their districts. The Director of Agriculture in his review of cattle breeding in the province in 1918-20 estimated that over 50,000 approved bulls in regular stud work were necessary. We consider this a reasonable estimate of the number required to effect anything like appreciable progress, and in view of the economic importance of cattle breeding in this province have suggested that Government should come to the assistance of District Boards in quickening our present rate of progress which is roughly about 250 each year under the present very precarious system of finding funds.

In anticipation of a large demand for stud bulls to satisfy the requirements of the province additional farms for the breeding of Hissar cattle under the supervision of the Civil Veterinary Department have been started in the Lower Bari Doab Canal Colony in the hands of private owners. The stock of these farms are all transferred Hissar bred animals, so that the breeding arrangements on these will be a duplicate of the breeding done on the Hissar farm, subject to

the way of rapid progress we are confident from the steadily increasing number of good bulls now being employed in the districts that the foundation stock in this province is being consistently improved, and that so far as our experience in the Punjab goes the deterioration of the Indian breeds so often referred to by certain authorities can very effectively be stayed by a more liberal system of feeding especially for the young growing animals. There appears to be such a desire on the part of certain enthusiasts to attempt to unduly hasten the progress of cattle breeding by crossing with imported European breeds that we feel it necessary to call their attention to the suitability of the pure indigenous breeds for Indian conditions of climate and feeding and their very marked insusceptibility to the contagious diseases in this country.

The Civil Veterinary Department has a fixed and definite policy with regard to cattle breeding, namely, the preservation and improvement of the indigenous breeds of the province by a process of selection from amongst the best specimens procurable. By the very thorough application of this principle on the Hissar farm the famous Hissar breed has been established, the progeny of which are so popular throughout the canal irrigated tracts of the province. Where a special local breed exists such as the famous Dhanni or Awankari breed in the Dhanni tract comprising parts of Attock, Jhelum and Rawalpindi Districts, a special effort is made to encourage it. The department, with a view to preserving this breed, has started a Dhanni cattle breeding scheme under which 88 approved bulls are enrolled for stud purposes in specially selected villages within the tract. These, whilst remaining the property of their owners, are subsidized with amounts varying up to Rs. 20 per month on condition that the services of these bulls are available for the villagers' cattle.

With the continuance of good harvests the scheme has become well established in the tract and has popularized the work of this department throughout these districts. As far as funds permit the number of subsidized bulls has been increased in order to serve a greater number of villages where the need for good bulls exists. The District Boards of Attock, Jhelum and Rawalpindi testify to the excellent effect which the scheme has had in the encouragement of cattle breeding and to the very noticeable improvement in the number of well bred Dhanni cattle now available in the tract. A keen demand exists especially for the better class Dhanni bullocks which find a ready market at very favourable prices.

A preliminary survey of the tract having been completed, steps are now being taken to start a herd book for this breed as a very necessary step towards maintaining the purity of this breed in future. To make a beginning, it will be necessary to offer some inducement to the owners of registered stock to abide by the conditions which need to be imposed in the interests of the breed. The District Boards concerned have been addressed on the subject. It is hoped that as soon as finances permit effect will be given to the recommendations made. It may safely be said that owing to the absence of railways and other ready means of communication with this tract, the Dhanni breed of cattle more especially as found in the Tallagang area is one of the purest indigenous breeds in this province. Conditions are, therefore, exceptionally favourable for the revival of this famous breed, and provided the necessary staff and financial support are available, it should be possible to make considerable progress. This statement, however, needs to be qualified with the proviso that ample fodder storage against the constantly recurring fodder famines will also be made. We look to the Agricultural Department to solve this difficulty.

Likewise in the Hariana tract, which comprises the districts of Rohtak, Gurgaon and Hissar, steps are being taken which are merely a duplicate on a large scale, through the agency of the local cattle breeders in villages, of what has already been done on the Hissar farm to revive what is popularly known as the Hariana breed. Efforts are being concentrated on selected villages of this area where the best specimens of this local breed are available. It is hoped that in time, by the judicious expenditure of money amongst cattle breeders in this area towards the purchase of stud bulls, and with the necessary supervision over the working of the scheme, considerable progress will be effected in grading up the local breed, and that selected bulls for stud purposes will be available for distribution in other parts of these districts as the scheme expands. It marks the beginning of any serious effort towards the development of the natural resources of the Hariana tract as a cattle breeding centre, and as a business proposition the scheme should commend itself to the attention of Government. The new irrigation works now in course of construction will increase considerably the area of cultivable land in the province for which plough bullocks will be required in large numbers. The importance therefore of developing the Dhanni and Hariana cattle breeding tracts to meet the requirements of the rest of the province will readily be admitted. Since the majority of the present irrigated districts are not by any means self-supporting as regards the plough bullocks they need, they are dependent on such tracts for the superior type of bullocks which are available there. This source of supply needs therefore to be encouraged where the cattle breeding industry can for economical reasons prove most remunerative to breeders.

To meet local prejudices, a number of specially selected young male stock have been purchased by the District Boards of Rohtak and Gurgaon in the Hariana villages and sent to the Hissar farm to be reared until fit for issue as breeding bulls. The Gurgaon District was

last year supplied with 116 stud bulls from Hisar and this year up-to-date 110 bulls have been distributed in that district, part of the cost being advanced in each case by the applicants.

A survey having been made of the bulls ordinarily employed for breeding purposes in the district, it was found that a large number were quite unsuitable stud animals; these are being replaced by bulls purchased from the Hisar farm. Zemindars in the Hariana District are fully alive to the advantages of developing the cattle breeding industry to meet the demand of other districts for better class bullocks—all that is needed is organization. The starting of co-operative cattle breeding societies by the Co-operative Department is, therefore, particularly opportune, which it is hoped will be of considerable help towards the success of the scheme. I wish to acknowledge here the readiness with which the District Boards of Rohtak and Gurgaon have adopted the scheme and the very considerable encouragement they have given since the scheme was started.

The efforts of the department have been principally directed towards helping the zemindars of the province to breed animals of a type which they most urgently require, namely, plough bullocks. We have preached the cult of the pedigree bull ever since we have been a department and can now claim to be one of the few departments in India with any real results to show in the districts. We feel that this success is in no small measure due to the policy of continuity adopted by this department, and in preaching consistently the preservation of the valuable indigenous breeds we have had the sympathy of all cattle breeders in our efforts. We can confidently state that we have achieved progress in proportion to the number of District Board bulls that have found their way into the villages, in proportion to the financial assistance we have received and in proportion to the cadre (subordinate and supervising) which has been placed at our disposal.

With the limited means available we grant that it has not been possible to give the attention to the improvement of the milking breeds as we desired. In this direction our energies have been directed towards the establishment of Montgomery cattle breeding farms. These include:—

Name of farm	Area in acres	Strength of herd
Jahangirabad Farm	1,220	8 bulls, 500 cows.
Chaudhri Allah Dad Khan's Farm	3,800	3 „ 125 „
Sir Louis Dane Cattle Farm, Kaliana	2,300	3 „ 150 „
Rakh Chandrai, Lahore Dairy Farm	1,137	6 „ 300 „
Montgomery Dairy Farm	485	3 „ 150 „

The total number of young stock on the farms at present is 1,000 approximately.

Also Government lands have recently been granted on lease to certain Junglis and Sayads of Shergarh and Hussaingarh villages in the Montgomery District on the condition that they maintain a specified number of Montgomery cows for breeding purposes to the satisfaction of this department. The locality chosen was once a famous centre for the Montgomery breed of cattle and is naturally well suited to the revival of this very famous milking breed. It should be possible to organize a big milk supply out of this area when the scheme has made some progress.

The distribution of Montgomery bulls to certain municipalities and the increase in the number of approved buffalo bulls throughout the province is also part of our programme. Private enterprise in the establishment of dairy farms for the milk supply of the large cities is being steadily encouraged as far as possible by Government, on condition that the breeding operations carried on should be controlled, so that the short-sighted policy of the *gouala* in having his cows covered by non-descript bulls may not be perpetuated.

The department is fully alive to the necessity of aiming at breeding higher milk yielding cows in greater numbers than are now available, and in the selection of stud bulls of all breeds. The milk pedigree is carefully considered before they are issued to the districts. It is not always practicable with the limited staff available and the liability to fodder famines as on the Hisar farm to attempt the carrying out of reliable milk tests of all the herd cows; the slower but less expensive system of testing in smaller numbers as at present adopted must be continued. Of necessity our further plans in this direction are largely governed by the staff and funds available for this work. It is intended that all the breeding farms responsible for the issue of stud

bulls to the districts should be given facilities to maintain accurate milk records of the herd cows with a view to more careful selection for milk yield. This arrangement is being adopted on all farms. The grantees of both the Hissar and Montgomery cattle grants realize the commercial value of recording the milk yield of their cows which enables them to weed out unprofitable animals from their herds. The Hissar bred cows, though wild and unmanageable at first, are with extra care and attention rendered more amenable. Arrangements have been made on the Hissar breeding grants for tying up cows as they come in milk and recording their milk yields throughout the lactation period; it is hoped that in time these herds will be rendered more docile and that the best milkers can be readily ascertained. We believe that with proper care the Hissar breed can with advantage receive more attention in the matter of selection for milk yield amongst the herd cows without any danger of reducing the value of the progeny as plough animals. We are therefore pursuing the development of the farms on these lines. Small beginnings have naturally to be made on account of the additional expense involved in the extra handling and management required.

In the improvement of the Montgomery breed we have certain very big difficulties to contend with, namely—

- (1) The best Montgomery cows are being purchased by the military dairy farms, some of which are crossed with an imported breed, the Ayrshire, for the production of cross-bred cattle, which is at variance with the settled policy of this department in the preservation and grading up of the indigenous breeds in this province for the benefit of cattle breeders in the districts.
- (2) That a large number are also being exported to Calcutta and other large cities outside the province. In both instances this is a direct loss to the progress of Montgomery breeding in this province, as in neither case do any of their offspring find their way back into the districts, or at any rate only a very small percentage.
- (3) By the extension of canal irrigation to the Montgomery District, which was the original home of this breed, the Junglis in whose hands the breed rested were gradually ousted, grazing areas disappeared and with them the breed gradually dwindled.

Whatever Montgomery breeding is done at present is being done either in the breeding farms or by the Gujars of the large municipalities, e.g., Amritsar, Lahore and Lyallpur. The latter unfortunately have no further interest beyond securing milk, and therefore allow their cows to be covered by non-descript bulls: this is to be particularly regretted as undoubtedly some of the best Montgomery cows fall into their hands.

If we consider the progress which has been effected in Europe in improving the milking breeds by means of milk records and milk testing associations, when we consider the effort which are being made to induce farmers throughout the country to adopt such measures, we are struck with the possibilities which the military dairy farms offer in this direction towards the improvement of the indigenous milking breed of this province and what little has been made up to date of these possibilities. As already stated, the best cows are bought up from the districts and are retained so long as they can be economically maintained as milch animals, whilst a very small percentage of young stock find their way back into the districts. This continuous drain of the best cows from the Montgomery District is accountable for the state of the Montgomery breed of cattle as we find it to-day.

The establishment of cattle depôts in connection with the military dairy farms would seem to be necessary where dry cows can be economically maintained until they come in calf and where the young of cows with good milking yields can be properly reared and nurtured. As the cows used on the military farms are all selected animals, surely, notwithstanding the economic tendency to dispose of them, their progeny should be catered for in the interests of the dairying industry. We are glad to note that lately this principle has been adopted: it is hoped that, in the interests of the milking breeds in the province, it will be extended as far as possible.

There are certain factors which militate against very rapid progress being made in reviving the Montgomery breed, namely, that very few specimens, if any, of the pure Montgomery breed are now available, and so little attention has been paid in the past towards maintaining the breed pure, that its resuscitation presents very great difficulties. It is questionable if it would not be wiser at this stage to forego the sentiment attached to preserving the characteristics of the Montgomery breed, and instead direct our energies towards producing an efficient dairy animal rather than an animal for show purposes. This is practically what the zemindar who values the milk rather than appearances has been doing with the original Montgomery cow as a basis, and this is why in Montgomery District, or in any part of the province, it is so difficult to find so-called Montgomery cows of which it could be said that they are really characteristic of the breed. We are inclined to the view therefore that we might in this province pursue the movement that has already made such progress in England and other European countries namely, the registration of dairy cows or its equivalent. In England the register is not confined

to pedigree animals. A cow of any breed, type or cross can be entered only if she has been awarded the Ministry's certificate declaring that she has yielded not less than 8,000 lb. of milk during a milk recording year or not less than 6,500 lb. milk on an average of two or more consecutive milk recording years.

The objects of the register are :—

- (1) To assist and encourage the breeding and improvement of dairy cattle of any breed, type or cross by publishing annually particulars of cows which have been proved by certificated milk records to possess high class dairy qualifications.
- (2) To provide authentic records of high class dairy cattle with a view to bringing buyers and sellers together.
- (3) To encourage the keeping of particulars of cows and heifers (including their certified milk record), which in course of time would make it possible to establish a register of cows with milk recorded pedigrees into which an animal of any breed, type or cross would be admitted, provided that a satisfactory number of its female ancestors possessed satisfactory milk record certificates.
- (4) To encourage the use of pedigree bulls for grading up non-pedigree herds.

We have given the details of what is a very definite movement in Europe and elsewhere, aiming at improving the efficiency of milch animals, which after certain modifications would be applicable in this country and would embrace both milch cows and buffaloes. There are certain details which it would be difficult to work in this country, but there is a policy involved in the movement which in our opinion is applicable in this country at present; it is therefore suggested as a guide to future policy in the encouragement of the dairy industry in this province.

(d)

(A. C. DOBBS, B.A., *Director of Agriculture, Bihar and Orissa.*)

The Government of Bihar and Orissa have adopted the policy of breeding cattle primarily for milk with a view to making the production of bullocks on arable holdings where stall feeding is necessary, profitable. Herds of milch cows are started whenever a demand for milk gives an opportunity of maintaining them economically, cows of any breed being purchased and the best milkers retained, and bulls of the Montgomery breed being used because this is the only Indian breed of which bulls with a good milking pedigree are obtainable.

There is a herd of about 60 cows at Ranchi and smaller herds on each of the large farms of the department at Cuttack, Sepaya and Sabour. It is proposed to establish a large herd at Monghyr to supply the Railway Settlement at Jamalpur.

The defect of this policy is that the Montgomery type of bulls and bullocks are unpopular owing partly to their slowness, which is undoubtedly a disadvantage when using a small country plough, and partly to their large amount of loose skin, against which there is a prejudice, justifiable or unjustifiable.

The question of introducing a single Hissar or Ongole cross in the male line, with a view to splitting the progeny into a large number of types as regards characters independent of milk, is under consideration. The objection to doing so is the small number of good milking cows available and the necessity of using them all for breeding pedigree bulls. The establishment of a herd book of purely Indian cattle and of some standard of milk production by which cows could be compared so that only cows above a certain standard and their progeny could be admitted to the herd book would advance breeding by a definite stage. In the first instance would it be possible to make milking capacity and resistance to rinderpest the only criteria for admission to such a herd book, so as to allow as much latitude in the matter of form, etc., as possible. It would then be possible to split up the breed so constituted into as many types as could inspire sufficient interest to define them.

(e)

(D. CLOUSTON, C.I.E., M.A., D.Sc., *Director of Agriculture, Central Provinces.*)

Cattle breeding. The steps being taken in the Central Provinces to improve the local breeds of cattle have been described in some detail in the cattle surveys for Chhattisgarh and for Nagpur and Berar Divisions. The department now has 9 breeding farms and 2 dairy farms including

the College dairy farm at Nagpur. Much difficulty was experienced in getting the basic stock for these farms, for there are no pure breeds in the provinces. Our cattle, like our crops, are hopelessly mixed, and in a tract famous for one particular breed the proportion of pure to mixed types is very small. We have, therefore, had to start our breeding operations with stock of poor quality and to improve it gradually by selection. On the 9 breeding farms, there are 6 different breeds of cattle. Of these 9 farms, 2 have been in existence for nearly 20 years and the herds of Gaolao and Malvi cattle kept thereon are now fairly true to type. The other 7 farms are of more recent origin and the types of cattle kept on them are not yet fixed. The total number of cattle on these 9 cattle breeding farms at the close of last year was 1,032. The expenditure amounted to Rs. 38,699-2-1 and the receipts to Rs. 27,733-5-1; the net expenditure was thus Rs. 10,965-13-0.

The results obtained on the Telinkheri dairy farm and on the College farm at Nagpur in crossing cows of our local breeds with Ayrshire bulls are promising as far as the milking qualities of the off-spring are concerned; but the cross-bred bullocks produced are not of the type which would appeal to the ordinary cultivator. They are inclined to be thin and leggy and are much less immune to rinderpest, foot-and-mouth disease and other contagious diseases than Indian cattle. On the College dairy farm the Ayrshire crosses are now being mated with a Montgomery bull with a view to giving the off-spring greater resistance to disease. On the Telinkheri dairy farm the crossing of cows of the Gaolao breed with bulls of the Montgomery or Saniwal breed has produced promising results. The Montgomery-Gaolao cross is an improvement on the pure Gaolao both as regards milk and draught; the cross-bred bullocks are well built, strong and tractable animals; and the cross-bred cows yield nearly twice as much milk as those of our local breeds. Given a herd of such cross-bred cows the owner can, after providing for his calves, add to his income by the sale of surplus milk, the value of which should more than cover the cost of feeding his herd. In the Montgomery-Gaolao cross, in short, we have a type of animal which fills the pail and gives satisfaction in the yoke. These results open up a vista of great possibilities for the cattle breeder of the Central Provinces, showing him as it does how he can, by combining dairying with breeding, add to his farming profits. This experiment in crossing is now being tried with three other herds. If the results prove to be satisfactory these herds will be gradually graded up to the Montgomery type by continuing to use bulls of that breed. The danger is perhaps that the Montgomery trait of slowness when at work will become too pronounced in time, though it has not done so in the first cross. In anticipation of a demand arising for Montgomery bulls a herd of selected cows of this breed is now maintained on the Telinkheri dairy farm from which bulls are being supplied to cattle owners desirous of producing dual-purpose cattle. For these bulls the demand is far in excess of the supply at present available.

The feeding experiments carried out by Mr. Allan on the College dairy, Nagpur, show that when a mixture of cotton seed cake and *khuni* were the concentrates used and *juar* (*Sorghum*) and hay the bulky fodder, the best results were obtained in the case of milch buffaloes when the quantity of concentrate fed daily was 58 to 60 per cent. of the milk yield. In the case of cows 40 per cent. gave better results. He has observed, too, that the careful rearing of buffalo calves has more effect on their size and milk yield on reaching maturity than in the case of cow calves.

A reference will be found in the cattle survey for Nagpur and Berar Divisions written in 1921 to the proposal to give small annual subsidies to cattle owners who maintain in their villages "certified" stud bulls whose services they are prepared to lend to other cattle owners. We are convinced that some such state-aided system of maintaining stud bulls in villages should help considerably to stimulate the interest of cattle owners in animal husbandry. It should serve as a most useful demonstration in scientific breeding, and encourage cattle owners to rear good bull calves with the hope of getting them certified by Government as suitable for breeding purposes.

The fodder problem in the cotton tract. In the Central Provinces there are three fairly well-defined agricultural tracts, namely, the cotton tract, the rice tract, and the wheat tract. In the cotton tract, the fodder question is not a very serious one, because as the grazing areas are very limited the cultivator is obliged to grow *juar* on a large scale for his cattle, and his draught bullocks are relatively good in consequence. In years in which the *juar* is a partial failure he generally manages to obtain grass from the forest or fuel reserves in his tract; in famine years he pays for baled grass-railed to him from other districts. Realizing as he does the importance of stall-feeding he makes a point of storing fodder whenever he can, and supplements the daily ration of *juar kadbi* or hay by a small allowance of cotton seed, tur husk and other concentrates. One of the advantages of stall-feeding is that the owner knows exactly how much food his cattle get per day: the man who makes no provision for stall-feeding does not. In this tract there are no irrigation facilities worth mentioning and *juar* is the most profitable fodder for the cultivator to grow as a dry crop. The Department of Agriculture is assisting him to increase his yield by supplying him with seed of improved varieties. How to make

juar silage is being demonstrated by the department on Government farms and at agricultural shows and other gatherings.

Experiments were carried several years ago to ascertain whether it would be possible to grow some of the best local grasses in rotation with the staple crops of this tract. Seed of these grasses was collected and sown in plots which had been carefully manured and cultivated. The results obtained showed that even the best varieties were never likely to take the place of juar; for juar yields much more fodder per acre and gives in addition a valuable seed grain. It is thus a dual-purpose crop, supplying as it does food for the bullock and the man who works it. It will be very difficult to find a crop which is better suited to the soil and climatic conditions of this tract; but what we do look forward to is the possibility of getting cultivators to make ensilage of at least a small part of their crop, and of inducing them to grow some of the sweeter and thinner stemmed varieties purely for fodder.

The fodder problem in the rice tract. In Chhatti garh Division, which constitutes the greater part of the rice tract, there are large stretches of level but very poor lateritic soil on which the only grass that thrives well is spear grass (*A. coarctatus*), the feeding value of which is low. An attempt was made by the department some years ago to introduce better grasses such as *Ischaemum sulcatum*, *Ischaemum laxum*, *Andropogon annulatus*, *A. carinatus* and others which are commonly found on black soil. They did not thrive well on laterite and the area was soon overrun again by the hardier spear grass. Spear grass being a slow grower is a poor pasture grass as it provides little or no grazing in the early part of the rains when cattle are emaciated and when other fodder is very difficult to obtain. Towards the end of October it starts flowering and produces hard sharp spiklets which tend to injure the mouths of the cattle which eat it. An experiment extending over three years was carried out some time ago to ascertain how far the feeding value of this grass could be improved by cutting it before the middle of October, i.e., before the spears formed. Ten young animals of about one year in age were brought from cultivators in surrounding villages and were grazed and stall-fed on it for a period of three years. At the end of that time these ten young animals had developed into useful draught bullocks which were much superior to those of the same age in adjoining villages. The experiment proved that spear grass cut before the middle of October is an edible and fairly good fodder. The failure of the average cultivator in this tract to provide his growing stock with a maintenance diet during the hot weather accounts very largely for their being so small and weak. It accounts, too, for the heavy mortality among his cattle in the early part of the rains when death is often due to their gorging themselves in rice fields in which they are allowed to graze at this season. The fodder problem is thus a serious one in this tract where rice straw is the principal fodder and where there is not even enough of that to satisfy the hunger of the large herds kept in every village. The comparatively large areas reserved for grazing produce spear grass—a short season variety of poor quality. But so long as such extensive areas are available for grazing, large numbers of useless cattle will be retained; no attempt will be made to grow suitable fodders, and the cattle problem will continue to be one which the department can do but little to solve.

The fodder problem in the wheat tract. In the wheat tract, the conditions as regards grazing facilities are more or less similar to those of the rice tract; but in this tract there are, in addition to the areas reserved for grazing, large stretches of deep fertile soil overrun with *Kans* grass (*Saccharum spontaneum*). *Kans*, however, is one of the least palatable of our local grasses and is not worth including in the category of fodders. Fields of tall *Lans* grass may be seen even in the beginning of the hot weather, a clear indication of the fact that it is not readily eaten by cattle. In this tract so little attention is paid to the storage of fodder that juar stalks are often left standing in the fields, the heads only being removed to the threshing floor. That the cattle problem in the tract is a serious one may be gathered from the fact that such a large area of good land is allowed to lie fallow owing to the weakness of the draught bullocks. Here, as in the rice tract, the area available for grazing is too large. No real steps are taken to grow and store fodder and the tendency is to keep more cattle than is needed. What is badly wanted is an increase in the area under crops such as juar, bajra and berseem and the cultivation by mechanical power of the large *Kans*-infested areas of this tract. In the wheat and rice tracts the irrigation facilities provided under Government tanks and canals should in the long run result in the area under these crops being increased and in their being more straw available for fodder. In course of time the cultivation of berseem will also be taken up in irrigated tracts.

The whole problem of how to improve the efficiency of draught-cattle in the province by better breeding and feeding is bristling with difficulties owing to the attitude of the people concerned. Even educated men who play an active part in public life make the mistake of opposing the slaughter of useless cattle and of demanding that village and forest grazing areas should be still further increased. If this policy were to be adopted the problem would become still more difficult. What is required is an improvement in the quality and a decrease in the number of cattle maintained; but any great improvement in the quality is well-nigh impossible so long as the cultivator relies as much as he does at present on grazing as a means of subsistence for his cattle.

The Department of Agriculture has for years been testing different kinds of fodder crops. Of those tried up to date, *berseem* (Egyptian clover) is one of the most promising; a fairly large area is sown with it on Government breeding farms where water is available. Some seed has been given out to selected landholders, too, with a view to encouraging them to take up its cultivation under tanks and canals. The method of raising a second crop after rice is already well known and widely practised; there is no reason why clover should not be grown in this way. It has been grown in this way on the Telinkheri farm for the last 12 years. The cultivation of the smaller bamboo (*Dendrocalamus strictus*) on the light lateritic soils of the Chandkhuri breeding farm has given promising results.

To enable the department to give more attention to the whole subject of cattle-breeding, cattle feeding and dairying the post of Deputy Director of Animal Husbandry was created and filled last year. The Deputy Director has as his first assistant a Provincial Service officer who has had a sound training in animal husbandry. This assistant devotes part of his time to propaganda work with a view to stimulating interest in the improvement of cattle by better breeding and feeding. He has been supplied with a magic lantern and several sets of slides dealing with different aspects of cattle breeding, feeding, and dairying, and he delivers lectures on subjects connected therewith.

The whole question of cattle improvement is intimately bound up with that of the fodder supply available in the province. During our long period of dry weather extending from October to June our village grazing areas though large are parched and dry, and do not provide the large herds grazed thereon with a maintenance diet. Herds sent to forest grazing areas are but little better off. Sufficient fodder to meet requirements is not stored with the result that outside the cotton tract cattle have to live on a starvation diet for the greater part of the year. The department cannot hope to effect any real and widespread improvement in the cattle of the province until it has first succeeded in converting cattle owners to a belief in its methods. The indications are that this can be done but it may take many years. There is already a good demand for stud bulls, including bulls of the Montgomery breed for which some of our more go-ahead land owners are willing to pay big prices. It will be the duty of the Deputy Director of Animal Husbandry to stimulate the interest which these men are taking in his work and to devise ways and means of getting them to lead the way in cattle improvement in their districts.

(f)

(S. T. D. WALLACE, V.C., B.Sc., *Deputy Director of Agriculture, in charge of Animal Husbandry, Central Provinces.*)

The following is a brief statement of the measures taken up to date for the improvement of cattle in the Central Provinces and Berar:—

Before the year 1922 there were nine cattle breeding farms and two dairy farms. The nine cattle breeding farms contained two pure bred Malvi herds, one pure bred Gaolao herd, one Khamgaon herd, and the remaining herds consisted of local cows crossed with Malvi or Gaolao bulls. Since the development of the Saniwal or Montgomery herd on the Telinkheri dairy farm, it has been decided with the approval of the Central Provinces Board of Agriculture to grade up all the herds on these cattle breeding farms by the use of pedigree Montgomery bulls as soon as these become available. On one farm, however, a pure Malvi herd is being maintained and on another a pure Gaolao herd with the object of supplying pure bred bulls of these breeds which are greatly in demand for draught purposes. The remaining farms on which cross-breeding is to be carried out are to be devoted to the production of milking strains and will eventually become practically pure bred Saniwal cattle.

In 1922 a scheme for the improvement of village herds by the use of premium bulls was introduced by the Department of Agriculture and approved of by the Local Government. Funds were placed at the disposal of the department for the purpose of granting premia to suitable persons who agreed to keep approved bulls in accordance with the regulations laid down. The applications for bulls under this scheme exceeded the number of bulls available from Government cattle breeding farms, but the scope of the measure has been widened by giving premia to good bulls bought from private breeders. It is yet too early to say whether the scheme has produced the desired effect or not. With a view to stimulating interest in improvement of cattle by better breeding and feeding a number of bulletins and leaflets published in the vernaculars have been prepared. Experiments with various types of fodders and small-power plants for the preparation of fodder have been and still are being carried out by the department.

In May 1923 the Local Government agreed to sanction the post of Deputy Director of Animal Husbandry whose whole time is devoted to work connected with the cattle industry; popular lectures illustrated by magic lantern have been made a feature of this section of the Agricultural Department's activities.

One of the chief obstacles to cattle improvement in this province is the impossibility of getting rid of useless animals through the agency of a slaughter-house. Efforts made by Government in this direction did not meet with success. In consequence, the cattle population of the province is now more than equal to the amount of natural fodder available to keep cattle in good condition. Work-cattle are on the whole inefficient and two or more pairs are kept where one good pair properly fed and cared-for would be capable of doing the same work.

There is a continual cry for the Forest Department to throw open more and more of the jungle areas to grazing. So long as this demand is complied with, large herds of cattle will be turned loose to graze at little expense and trouble to the owner who obtains a small return for each animal and must therefore keep large numbers at the expense of quality in order to get any return at all.

If some system could be devised of permitting the removal of grass in the form of hay from jungle areas instead of its removal by large herds turned loose to graze, then the cattle owner would be compelled by the labour involved to realize that it was better to keep a few good cattle than a large number of inferior ones. This is a proposal which it may be difficult to carry out on political grounds as the erection of slaughter-houses and tanneries has proved to be on religious and sentimental grounds.

(E)

(J. N. CHAKRAVARTY, B.A., M.S.A., M.R.A.S., Deputy Director of Agriculture Assam.)

The principal work of the Agricultural Department in Assam in the improvement of cattle has been the maintenance of a herd of improved cows at the Shillong farm. The farm was started in 1897 and a small herd of cows was located there almost from the beginning. A few cows belonging to what is popularly known as Taylor breed were obtained originally from Patna. This is a cross between the local cows and Australian bulls. The herd has been found to be thriving very well in the Khasi Hill. Crosses were also made between these and Bhutia breed as well as with Montgomery bulls. It was felt, however, that the money available and the supervision which it was possible to give to this farm did not admit of any definite crossing or other complicated experiments to be made. During the last four years, the experiment has been confined to attempts at improving the milking capacity of the cows by careful selection and management. To prevent inbreeding new bulls have been imported from time to time direct from Patna. 500 lb. per lactation is considered a very good average for Assam cows and that for Khasi cows is still less. It may be incidentally noted here that Khasis do not, as a rule, drink milk but rear the animals for ploughing and slaughtering. Very few of the farm cows give less than 1,000 lb. per lactation, and by weeding out all inferior animals the average has been brought up to about 1,500 lb., some of the cows giving 2,000 lb. or more. It is hoped to raise this to 3,000 lb. within the next few years. This of course is not a very high yield. But it must be considered that the main object of the farm is to breed cows suitable for the average house-holder who has now got a cow giving an average of 300-400 lb. only and who wants a cow which can be reared comparatively cheap. The young heifers of this breed are in great demand among the cattle owners of the Shillong town, where they thrive very well and where they are gradually replacing the indigenous breed. The bulls have so far been taken mostly by tea planters most of whom keep a considerable number of cows in each plantation. A very successful feeding experiment carried out at this farm is the preservation of green fodder in ordinary pit silos throughout the winter. The bulls, however, have not proved invariably successful in the plains of Assam. In many places they have succumbed to infectious diseases or wild animals. Whenever it has been possible to use these for very considerable periods they have left a distinct mark on their progeny—particularly regarding milk yield. Accurate information about their progeny is being collected with a view to determining how far they will be suitable for the plains of Assam. The male progeny, however, have no distinct humps and are not, therefore, very popular as plough animals. Cultivators want rightly or wrongly a distinct hump in all their plough bullocks. What they want is an animal somewhat of the Khasi type but smaller. A larger number of up-country bullocks are now purchased by the cultivators of Assam every year for ploughs. The first object of any scheme of cattle improvement must be the production of an animal somewhat of this type. It will, however, be some

time before this province can have a cattle farm of its own. With a view to make a beginning 8 bulls were purchased from the Rungpur cattle farm last year. The bulls have been for the present kept at the Government farms and with selected private persons for the use of the public. Steps are being taken to reserve about 1,000 acres of Government waste land in Central Assam for a cattle farm which may be started when funds permit.

(h)

(W. DAVISON, B.S.A., *Live Stock Expert in Mysore.*)

In a note placed before the Board of Agriculture at the session in February 1922, the methods being employed and planned for the improvement of the cattle of Mysore State were outlined. As it may interest the members of the Board to know what progress has been made in this work, the present note will aim at very briefly stating progress made up-to-date, in so far as this can be measured in the space of two years.

Draught cattle. In the previous note referred to, it was stated that the improvement of draught cattle must be done chiefly through the use of good draught bulls. The maintenance of bulls at veterinary hospitals and Government farms for public service has been adopted as a means of awakening an interest in this matter, and several of these have been put on a circuit to widen their sphere of influence and enlarge the territory of demonstration. Owing to financial difficulties it has not been found possible very materially to increase the number of animals used in this way; the actual increase being only 4 bulls over a previous total of 14 in December 1921. The actual progress made by this system is not easy to measure, and can only be gauged by the number of services given, and by any tendency there may be towards an increased demand for good breeding bulls by private owners. The number of coverings has been steadily on the increase as the following table shows, though the coverings on tour have shown a decrease in 1922-23 to those of the previous year. This, however, shows some signs of recovery. The number of tour coverings from July 1st to November 30th, 1923, is 47, and as December, January and February are usually the months in which the largest number of coverings take place, it is reasonable to expect that the number for 1923-24 will equal that of 1921-22, and that in spite of the fact that 4 bulls have been temporarily withdrawn from circuit on account of the difficulty of obtaining fodder for these due to the fodder shortage in the areas in which they travel.

No.	Items	1921-22		1922-23		From 1st July 1923 to end of December 1923	
		Hd. qr.	Tour.	Hd. qr.	Tour.	Hd. qr.	Tour
1	Number of coverings from 1st July 1923 to end of December 1923 and for the last 3 years July to July.	672	128	988	94	513	47

The number of services is, moreover, a criterion which is liable to misinterpretation unless carefully analysed. In most cases, the veterinary hospitals or dispensaries at which the bulls are stationed are at the headquarters of either a district or a taluq, and analysis of the covering registers brings out the fact that, in the case of bulls which are not on circuits, a large percentage of the cows covered are either the property of the various Government officials, stationed in the town or belong to merchants or other towns people. In these cases, the owners are usually interested only in getting their cows in calf, fostering hopes for milk in due course, the calf being looked upon only as an accessory nuisance. Coverings such as these cannot be regarded as furthering the production of better cattle nor of any propagandistic value, though they may swell the annual figures. The figures available were recently tabulated with a view to compare the value of touring and stationary bulls from the coverings made on town cows *versus* country cows and the results were of interest. It was found that of the cows covered while the bulls were in headquarters, between 50 per cent. and 90 per cent. were owned by town residents, and of the cows which were taken to the veterinary hospitals during the absence of the bulls nearly 90 per cent. were again town owned. On circuits, all cows covered were owned by ryots. By following up the calves born to these bulls, it has also been made quite apparent that in

the great majority of cases, the calves born to these town owned cows are neglected, and that the covering was made for the sake of getting the cow in calf for future milking purposes, the calf being looked upon as a necessary nuisance. On the other hand, in the case of the ryot owned cows, the calf has usually been the objective and has been carefully reared. The natural conclusion, therefore, is that the bulls sent on circuit, though they actually cover less cows, do far more good than those permanently kept in veterinary hospitals and dispensaries. While it is obvious that the number of bulls which can be reasonably maintained by Government agencies can never be sufficient to make an appreciable effect on the stock of the country, the propagandistic effect of these bulls depends upon the number of good calves sired in such places where they will be an object lesson to the ryot population. From this standpoint, the circuit system seems to fully justify itself. It is also a fact that where bulls have been on circuit for a year or more, castration has been on the increase and a demand has arisen for breeding bulls, which, though not yet very strong numerically, is at least encouraging and indicative of expansion. The number of castrations performed has shown a marked increase, and a decided difference can be noticed in the attitude of the ryots toward this operation, who come forward and ask the veterinary staff to visit their villages for this purpose.

Items	1920-21		1921-22		1922-23		From 1st July to end of Dec. 1923	
	Hd. qr.	Tour	Hd. qr.	Tour	Hd. qr.	Tour	Hd. qr.	Tour
Number of castrations for the same periods.	870	6,150	1,906	16,376	2,239	20,629	686	11,163

To make it possible that an increased number of good bulls may become available for purchase by ryots at reasonable prices, and assist in satisfying an already strong demand for this class of animals, proposals have been put before Government which will make it possible to turn out annually from 200 to 250 sound and suitable bulls. The scheme entails the utilization of the existing Amrit Mahal herds, which have been maintained by Government since before the days of Tippu Sultan in a comparatively pure state. These herds which number 9,000 head in all have heretofore been used solely for the supply of transport bullocks for military use. The decreased requirements for this purpose and changed views with regard to the necessity for assisting in the improvement of live stock have resulted in the transfer of these herds from the Military to the Agricultural Department which took place during the year 1923. It is anticipated that the proposals now under consideration of Government will be favourably received and that some really substantial work will be possible in the near future. The Amrit Mahal breed has been developed originally from the better class of indigenous stock and is admirably suited to combine with the bulk of the cattle of the State. The cattle of this breed are noted for their quality, quickness and courage, and although not very heavy animals (bullocks running from 800 to 1,000 lb. in weight on the average), are excellent draught cattle and especially suited to road work. These cattle are, however, poor milkers, which is true of all the cattle of the State. While the cows can supply what milk is required for the family use of the ryot owners, they are totally inadequate as dairy cattle such as are required to develop a dairying industry in its purer sense, or to cater to the demands of the larger cities and towns. To develop these animals in this direction would require generations of strict adherence to a system of selective breeding. In the writer's opinion, the length of time required would be antagonistic to a continuity of policy and the ultimate accomplishment would be of a confused nature, if indeed it reached the stage when the development could be regarded as an accomplishment. The present policy, therefore, with regard to developing a dairy breed does not aim at the dual-purpose animal and this problem is being attacked in a different way.

Dairy cattle. Experimental work with this class of cattle is being carried on at Mysore on the Kaysanekere dairy farm, which is the property of His Highness the Maharaja of Mysore who has graciously permitted its use for this purpose and who finances the farm from his personal funds, thus showing an interest in the subject of an extremely practical nature. Two breeds are being used as foundation stock, the local Mysore or Hallikar cows and Sind cows. The latter constitute three-quarters of the herd which is now 90 cows strong. Crossing is being done on all cows with Holstein Friesian bulls, of which three are now in service. In the matter of milk yield, the herd is in much the same condition as it was two years ago, as very little change has been effected beyond the weeding out of some low producing animals and the addition of some Sind heifers which have recently come to their first lactation. As the cross-breeding operations only commenced two years ago, none of the half-breeds have yet been bred, the oldest being now fourteen months old. Altogether fifty heifer calves have been born from these crossings. The calves got from this cross are, however, quite promising. Birth weights have

exceeded those of any other animals born on the farm, including some Ayrshire crosses on the same female parent stock, and the rate of growth has been good. The oldest heifer referred to above weighed almost 700 lb. at 12 months of age, and throughout all calves have done well. It yet remains to be seen how they will develop and milk.

Fodder crops. Vitrally connected with the improvement of live stock is the subject of fodder crops. The cultivation of crops purely for fodder purposes is a phase of agricultural activity which needs extensive encouragement and increase. To find out the most suitable crops for this purpose, the best cultural methods, and the highest yielding varieties, etc., is an extensive work in itself and has not so far been tackled in the Mysore State to any extent. Preliminary work in regard to grasses has been carried out by the Botanical Section, but no field scale investigations have been started. Sun-flower has been introduced and has shown itself to be a valuable fodder crop, with an ability to withstand severe drought and yet yield well. Being a short season crop, it can be grown at times when *Sorghum* would be unable to complete its growth and is also valuable as a means of controlling weeds. Some experimental work was done during the past season in the matter of cultural methods, but it is hoped that more extensive operations in this direction will be possible in the future and the formation of a special fodder crop section of the Botanical Section will be accomplished before long.

For the last three years, efforts have been made to popularize silos, especially in the Malnad areas where large areas of good grass are allowed to be wasted or burnt every year. The difficulty of getting labour at the right season has been one of the factors operating against success in this direction. However, some interest has been awakened and several clients are making ensilage in these tracts, while in the Maidan areas a few members of the Agricultural and Experimental Union have grown sun-flower and ensiled it during the past year. The extremely unfavourable season, however, prevented a number from so much as sowing the seed, so that the spread of this system has not been as large as it otherwise would have been.

(i)

(C. V. SANE, M.Sc., B.Ag., *Director of Agriculture, Baroda.*)

The establishment of the Baroda cattle breeding farm and the palace dairy, although conceived long ago, has been a matter of only a couple of years and represents rather a chequered history of changing vicissitudes.

The dairy or what may be considered as the nearest approach to it in the old days, namely, the Gaushala, has been a feature of the palace requisites for a long time. Up to the year 1884, the animals constituting the Gaushala were freely grazed and milk sent to the palace. The inherent weakness of this method soon became apparent and a system of contract for dairy supplies of the palace was resorted to upto 1904. The remedy in this case proved worse than the disease as could have been easily foreseen in letting such an important matter affecting the health and comfort of Their Highnesses to be without proper supervision and control. For another decade, a new turn was given to the subject, and it was attempted to run the show on a business footing without much of an improvement, until in 1915 it was again taken up by the Department of His Highness' Household and placed in charge of a special officer trained for the purpose. The Gaushala now began to function as a dairy proper and supplied the palace kitchen with dairy produce in the shape of not only milk as of old but with cream, butter and ghee also.

We entered on the final stage of the evolution of the present institution in the year 1920, and for this we are mainly indebted to the advice of Mr. William Smith, Imperial Dairy Expert, when he paid us his first visit. Not only the possibilities but the necessity of such an institution for public benefit in the improvement of cattle breeding had not escaped the searching foresight of His Highness the Maharaja Sahib, but the combination of a keen desire for such an institution in the mind of His Highness, the encouraging advice of Mr. Smith and the driving force behind the movement of Mr. Seddon, the Minister for the department, was needed to make it an accomplished fact. It has now borne fruit in the shape of a cattle breeding farm and the palace dairy to-day.

It will be easily seen that the raw material for cattle improvement in an institution of such a chequered history and an uncertain aim is bound to be of a mixed character. Thus the Gir, the Sindhi and even the Saniwal of Punjab in the cows, and the Surti, the local of Delhi and an occasional Jafferbadi in the class of buffaloes were to be found in the herd. The question on what breeds to concentrate first attention was an important issue, and decision has been taken for first effort with regard to the Kathiawar breeds of cattle, Gir cows and Jafferbadi buffaloes. To those who are conversant with conditions in Kathiawar with regard to these breeds, the reason of this first choice of far off Kathiawar in preference to work nearer

homo and the centre of administration is readily explicable. Interests in Kathiawar are so minutely fragmented that none barring the Baroda State, although its interests there are the least of all its possessions, can meet a problem of such a general character. A lack of such close interest in this breed has resulted in a complete degeneration of the breed as a distinct type, and but for the intervention of this State, even at this late stage, it would have been a matter of only a few more years for the total extinction of the breed as a pure type. The hopelessness of the situation can be easily pictured when we consider the fact that in spite of our scouring the country lengthwise and crosswise, with plenty of funds in hand, we have not been able to secure even one first class typical specimen of the Gir cow or the Jafferbadi buffalo. While both species have been found to be tending to mongrelism, the case for the buffaloes is even worse than is the case with the cows.

The Gir cow has engaged our attention for some time past, and we can say without exaggeration that nowhere else would such a typical collection of the Gir breed of cows be found inside or outside of Kathiawar. The task of building up of the Jafferbadi buffalo we have but commenced of late, but we think we have adequate raw material to found a pedigree herd.

The Gujarat breed of Wadhbar and the Kathiawar breed of the Gir cows have of late filled the minds of the public considerably, largely on account of the coincidence of their export by foreign purchasers and the rising price of milk and milk-products. There is little beyond this coincidence in the nature of cause and effect in these happenings as any one with an impartial consideration of the subject will find, but the fact remains that when one tries to secure typical specimens of the breeds, they are hard to find. The lot that is left behind is distinctly of a deteriorated kind. The providential existence of the Chharodi cattle farm has to a certain extent kept up the Gujarat breed in some form, at any rate there is the material to build from, but of the Kathiawar Gir, what is left behind is a mass of mongrel material. The embargo on export of the typical specimens cannot further be delayed if the situation is not to be reduced to one of sheer hopelessness.

The project of the cattle breeding farm is to maintain 40 Gir cows and an equal number of Jafferbadi buffaloes which could all be pedigreed in course of time. To-day we have 39 cows and 32 Jafferbadi buffaloes and the herd includes animals with the following performance :-

Seven buffaloes with milk yield per lactation of—3,015, 4,865, 4,721, 4,432, 4,371, 4,162, and 4,072 lb.

Seven cows with milk yield per lactation of—4,037, 3,509, 3,242, 3,081, 2,989, 2,900, and 2,659 lb.

We have begun by selling a farm bred 2½ years old bull at a modest price of Rs. 300 and hope shortly to be in a position of almost a monopoly for pedigreed animals of the two Kathiawar breeds.

While we are doing this, some important questions regarding the improvement of these breeds arise and in the absence of the Cattle Board that was recommended to be instituted at the last Board Meeting, none but this Board can authoritatively deal in their direction and settlement. These questions are both of an internal and external character. The advisability of dealing with breeds out of their natural environment has always been a moot point. A question is often asked as to why the problem of the improvement of Kathiawar breeds is tackled under other conditions. The question is a pertinent one. The Baroda Government had once considered the possibility of making the breed improvement as an adjunct of the existing farms, and whether it is not an advisable course under the present conditions of breed standards and their acknowledgment deserves more than a passing consideration. While conceding the point regarding natural environment, the Baroda Government have taken up this work in Baroda on a variety of considerations, not the least of which are the necessity of an institution for palace and hospital milk supply and the certainty of close supervision. Still it is a point on which the Board may express an opinion.

The other points are with regard to internal improvement. In Gujarat, the Gir breed is the only dual-purpose breed, better so in fact than the Sindhi or the Sanwal. It gives a much harder type of draught animal, while as a milk-producer it is not of an inconsiderable importance. As a milch animal, its chief drawbacks are irregularity of breeding and lack of steady milking. While these may, to a certain extent, be modified by careful feeding, and judicious selection in course of time may overcome them, they appear to be basic in the present day formation of the breed characters. The breed nearest to it in the way of situation as well as constitution of the fundamental characters, namely, the Sindhi, shows positive factors regarding both these defects. If we consider a whole colour as the natural one, we will have to consider the Gir as a mixed breed as speckled is the prevailing colour in the breed. There is little doubt that Sindhi and Gir breeds have some common genetic factors in their constitution. Is it desirable, even if possible, to make use of this early blood relationship to infuse Sindhi blood into the typical irregularity of breeding and lack of steady milking apparent in the Gir breed of to-day?

No matter how much we may hope for greater utilization of the cow for dairy and draught purposes, so long as *ghi* remains one of the most important articles of diet of the people of this country, the unrivalled superiority of the buffalo as a *ghi* producer will always find a place for the buffalo in farm live stock keeping. On the other hand, no matter how persuasive we may be in the better utilization of the male buffalo, one-half of the normal progeny of the buffalo must be considered as without economic value. The type to breed from in the case of the buffalo must, therefore, be different from the one fixed for the cow where both the male and female progeny are of economic value. The type to breed from in the buffalo class must be one which will persistently milk for a long period without annual intervention of the stimulation by calving. Of course, the persistent milking must be on an economic basis, but whether there should be this difference in the ideal to be built up to in the cow and buffalo class needs serious thought for reasons discussed above.

The expression of an authoritative opinion on these points by this Board would be most welcome in clarifying the position with regard to the difficult question of cattle improvement.

(j)

(K. W. FORMAN, B.S.A., *Professor of Dairying and Animal Husbandry.*
Allahabad Agricultural Institute.)

I wish to write briefly on one phase of the subject under discussion:—

I am not familiar with what the Provincial Governments and Indian States are doing for the improvement of cattle by better breeding and feeding. I am of the opinion that it is so planned that each province and State will have its own Cattle Council and this is to be indirectly under the direction of an Indian Cattle Council.

One of the most important steps, in my opinion, that this National Cattle Council should take up is to establish herd books of each breed of cattle and encourage cattle breeding by holding official tests on milch cattle through an organized Cow Testing Association. Such a system will encourage all owners of cattle to register their cattle in such an Association by making a record. This will increase the value of their cattle and they will be in a position to sell breeding stock. This will affect and improve the cattle of the whole country. All records of such an Association will be sound and infallible and all persons will feel confident in buying registered cattle.

The largest Association of breeders of pure-bred cattle to-day, namely the Holstein-Friesian Association of America, places all breeders on a par, rendering it very easy for any breeder to establish the value of a pure-bred cow, just as the mile-track will establish the value of a trotting bred horse, and the expense is very moderate.

The Association not only charges nothing for the entry of such a cow and her record in the advanced register, but to encourage the breeder in that direction, it pays out every year large sums of money in prizes; neither do the State Agricultural Colleges make any charge for their supervision in the matter of making these records, their only charge being for the time and necessary expenses of their supervisors who are sent out by the professors of Dairy Husbandry to conduct the testing, and as several cows may be under test at the same time, the expense per animal may be made light. The Association started its activities by making seven-day, fourteen-day and thirty-day tests six days after calving. It increased the efficiency of its system by authorizing other official records to be begun not less than eight months after calving and semi-official yearly tests. This gave the breeders a chance to show the staying qualities of their cattle. The results have proven very satisfactory.

Prizes are awarded for the best records made in four of these divisional tests, so any breeder may win three prizes in each division or twelve prizes in all.

The rules for the entry of cows in the Holstein-Friesian Advanced Register are very stringent, being designed to place every record beyond even a shadow of a doubt. Every milking during the period of test must be watched, weighed, sampled and tested by a representative of some State Agricultural College and, because of resulting expense, the bulk of its records are for short periods, largely for one week.

All cattle are classified in eight sections:—the first class is for bulls—a bull must be a sire of four or more daughters which have been admitted in the Registry. The second class is for junior two-year old cows. The third class is for senior two year olds, and so on until the eighth class which is for all animals calving at or above the age of five years.

I wish to close by quoting Mr. S. Hoxie, a former Superintendent of this Association. He writes in favour of the Holstein-Friesian breed, but this can be viewed in the light of all breeds regardless of country or breed. Speaking of this system he says :—

"What will be its effect upon the general interests of the breed? This naturally will be the first question in regard to this system. The answer as naturally follows: If the publication of milk and butter records in fugitive ways, in the past, has given a worthy reputation to the breed, how much more should the substantiating and gathering together of such records add to that reputation? The records of our grand cows are a common heritage, and no friend of the breed can doubt the utility of gathering and preserving them in some unquestioned form. In this work large and small owners have equal opportunities. In public journals large advertisers take precedence. It would seem that on the ground of common justice some work of this kind is needed to awaken in all breeders equal incentives to improvement, and especially to inspire smaller owners to join in further building up a reputation for the breed in which all shall continue to feel a common pride.

"The information gathered by this system in regard to the structure and style of our noted cows must be of value to all who are interested in improving the breed. The means are here afforded of determining models, and of intelligently seeking such combinations of breeding as will produce our ideals in form and structure. Years will add especial value to this part of the work. The time is coming when it will be regarded quite as important to trace peculiarities of structure and peculiarities of qualities in the lines of ancestry as to trace pedigree.

"This system is also a light offering to science. There is yet to be a science of cattle selection and cattle breeding. But such a science can never be established without a multitude of observations such as this system records. Finally, it may be said that it is a step in the direction in which all progressive breeders and thinkers upon cattle subjects are looking. It destroys no institution to take its place. It is simply a step forward into an unoccupied field."

It seems that any such system of recording for the whole of India should be done by a National Cattle Council with the Imperial Dairy Expert as superintendent whose office would be the headquarters of this Association. He could utilize the different agricultural institutions in India that are qualified to send out supervisors; and some supervision could also be carried out through the Government military dairies and other Government institutions. The working out of such a scheme should not be difficult to handle. It seems that without some system of cow testing and recording of records and pedigrees in herd books, we cannot hope to get the fullest enthusiasm in the improving of live stock and also anything very fundamental to carry on any extensive breeding programme all over India among private persons as well as private and Government institutions.

APPENDIX IV.

(a) The veterinary aspect of a cattle breeding policy.

(J. T. EDWARDS, B.Sc., M.R.C.V.S., Director, Imperial Bacteriological Laboratory, Muktesar.)

The whole question of cattle breeding, particularly when it is subjected to discussion by a central representative body, is intimately interwoven with principles upon which expert veterinary guidance must be obtained, for it is the general experience of all countries that no progress can be made in developing the cattle industry unless the breeder is reasonably assured that his efforts will not be nullified eventually by the incursions of disease. Items Nos. 1 and 2 of the topics suggested for discussion are therefore of profound veterinary interest, and as it is imperative that both agricultural and veterinary authorities should act in unison in order to secure advancement in the cattle breeding problem, I would commend to the close attention of the conference the resolutions passed by the Second Veterinary Conference, held at Calcutta in February-March last, in which the main issues concerning animal disease problems in India were discussed, and I would enjoin the conference to pass a resolution to the effect that they endorse the findings of the Veterinary Conference. The experience of field and laboratory workers in this country shows that disease in cattle is a factor meriting greater consideration in India than in perhaps any other country in the world, for investigations show that the cattle population is afflicted with almost every known form of serious contagious disease which acts as a deterrent to the development of cattle breeding as an industry. Outstanding examples are rinderpest, haemorrhagic septicæmia, foot and mouth disease, blackquarter, anthrax, the piroplasmiasis (including tropical "red water," *Theileria mutans* infection, and, it now transpires, a condition which appears to be indistinguishable from the formidable East Coast fever of Africa), the trypanosomiasis ("surra"), severe worm infestations ("helminthiasis"), diseases caused by ectoparasites (ticks *per se*, mango mites, and biting flies), contagious abortion; and (but hardly to a small extent only) tuberculosis. All these are certainly "cattle breeding problems where the policy of one province or State particularly concerns other provinces or States," and "aspects of the cattle breeding problems on which action seems necessary."

In other countries, with a federal system of Government, the importance of disease as a limiting factor to the economic development of the cattle industry has been recognized so fully by the Central authorities that they disburse annually large sums of money for the elucidation of disease problems.

Thus, from authoritative information obtained, in the Union of South Africa the total capital expenditure in buildings at the Veterinary Research Laboratory, Onderstepoort since its inception in 1909 amounts to about £300,000, and the voted budget grant for the year 1922-23 to over £100,000 (salaries £41,658, expenses connected with research work, routine work and general upkeep and maintenance of the parent and branch laboratories £46,000). This annual expenditure is balanced by a revenue derived from the sale of laboratory products, etc., varying from £35,000 to £45,000.

In the United States of America during the year 1922-23 a sum of 6,968,070 dollars was indicated for the Bureau of Animal Industry (the veterinary bureau of the United States), and in addition a sum of 3,000,000 dollars for meat inspection. This total of approximately 10 million dollars was expended as follows: (2) for measures for the control and eradication of animal diseases such as tuberculosis, 44 million dollars; (3) for scientific research, approximately, one million dollars. In addition to these sums appropriated by the Federal Government, each State makes some provision for similar activities within its own borders.

The above figures illustrate convincingly the attitude adopted by countries which consider the development of their cattle-breeding seriously. There is hardly any need to draw comparisons between cattle as an economic problem in the life of the country in India and in South Africa, and yet the sums allotted for research into animal disease in the two countries exhibit great disparity.

(b) Cattle problem in Madras.

(R. W. LITTLEWOOD, N.D.A., Deputy Director of Agriculture for Live Stock, Madras.)

Registration of breeding bulls. For a commencement this could be confined to large towns, such as Madras, Madura, Coimbatore, etc.

Anyone keeping or wishing to keep a breeding bull for breeding purposes must apply to the Corporation or Municipal Council for a license. The bull will then be inspected by an officer of this Section or the Civil Veterinary Department, and if approved a free license will be granted. If the bull is uncastrable and the owner refuses to castrate it and is determined to use it, he may be called upon to pay a tax, say, of Rs. 50 per year for his license.

Anyone using uncastrated bulls in these cities and towns will be fined up to Rs. 100.

Slaughter of good cows. Slaughter of good cows and heifers, after they go dry, should be stopped as far as possible. Government could possibly lease out forest reserves to Milkmen's Associations or Agricultural Co-operative Societies, etc., for grazing grounds at a nominal sum. Government could purchase good cows when dry from the milkmen and then when they calve sell them back to the milkmen at the same price plus cost of feeding and labour. Government could take a large forest reserve, graze these animals and give a little concentrated food. Agreement would be drawn up and signed by milkmen.

Cattle shows.—Cattle shows should be encouraged in breeding districts, and substantial prizes awarded to good calves, heifers and cows.

Besides awarding prizes for the best bulls each village could compete and send its best breeding bull to the show, a special class could be formed and a medal awarded for the best bull, thus creating competition between villages. A village once it won the medal would become keen and its cattle would become well known.

(1) *Breeding operations carried on at Coimbatore.*—Cross-bred herd. Ayrshire-Sindhi and Ayrshire-Saniwal.

We are now getting the third generation calves and these are good animals.

(2) *Pure Sindhi herd.* Proposed to grade up by selection. Two good bulls from dams which have yielded over 5,000 lb. of milk in one lactation are now ready for service and will be used.

(3) *Pure Montgomery herd.* Five cows and one bull were bought from Pusa. Cows are not good milkers. The bull is a fine animal and we may get good calves by him. None born yet.

(4) *Cross-bred herd.* Cross-bred breeds with various breeds all mixed up, there are the progeny of the cross-bred cows served by a bull of Ayrshire-Montgomery strain named "Pusa."

The cattle are used for education purposes for the students; they are taught the proper system of feeding and rearing. They have to work in the yard and do the feeding themselves. They are taught butter-making on up-to-date lines.

The stock and dairy are viewed by the ryots of all the neighbouring villages who bring their friends along to inspect them. Every assistance is given in explaining to them what is going on; they are very interested in the cattle.

In another year or so I shall have too many animals and it is proposed to hold an annual sale each year at Coimbatore, the same as at Pusa and to distribute good milk animals, etc.

Pedigree herd. I hardly think this is practicable at present. The average stock keeper will not trouble over this as the breeders will keep only 5 or 6 cows each; this applies to both Ongole and Kangayam breeds. Pattagar of Palayakottai refuses to keep registers. I have asked him several times to open one but he declines and prefers to rely on his memory.

I persuaded the Buckingham Mills to open a cattle register and they have done so; they also keep milk records.

The Rajah of Undur keeps records of a kind of his animals; he promised to keep milk records also.

Special facilities to cattle breeders. The Government of Madras have already passed an order granting land to cattle breeders who are keen to expand their business, but on this matter it is better to go slowly as applications have been turned down by this department of men who applied for land for this kind of work and who had no interest in cattle breeding but simply wanted to procure the land. Land has been handed to one large cattle breeder for this purpose and two other applications are still pending. This is a step in the right direction if only we can

get good and keen stock breeders to come forward, and I encourage this system if when they have got the land, they carry out our advice and only keep good class stock.

Dairy industry. This can be done by Government placing good dairy bulls for pedigree stock in large towns and educating the milkmen to feed and look after their heifer calves better. At present these are neglected. In places where Government stud bulls are stalled, it is advisable to offer substantial prizes for female calves born to these bulls. This is being tried in Madras this year. The dairy cattle in most of the large towns and cities are stalled either in the yards or houses of the milkmen and these people live in the slum parts of the town and so the places are in a very unsatisfactory condition. The Corporation of Madras decided to build a cattle yard so that milkmen could stall their animals under sanitary conditions but the site they selected was not suitable. It was near a refuse tip and so the stalls are only half filled.

The Corporation could insist on:—

- (1) Milk standard.
- (2) See that the animals are stalled under sanitary conditions preferably on the outskirts of towns and city.
- (3) Assisting milkmen's associations or agricultural co-operative societies in opening milk depôts where pure and clean milk could be purchased. Price paid for milk will be according to the amount of fat present in the milk. This is done in the College Dairy at Coimbatore.
- (4) Distributing good milking cows to the milkmen on reasonable terms, provided the milkmen look after their animals well.
- (5) Purchase of heifer calves from good milkers belonging to the milkmen; that is, if he has no accommodation to keep the animal after the dam has gone dry, and then re-selling it to one after the heifer calves through his association or society.

Disposal of surplus Government animals. This has been encouraged. Cattle are bought from military dairy farms for private customers in this presidency, that is if none are available from the college herd.

List of animals available for sale at all Government dairy farms and breeding farms could be circulated through each Director of Agriculture. There were a number of useless breeding bulls in the Madras City and several of these have been eliminated now through my placing six good bulls at stud in the city and charging a less fee to the milkmen.

Transport facilities for live stock. The railway authorities should be approached to allow calves to travel in the luggage van of passenger trains provided they are tied in gunny bags, the same as done in England. Instead of this, one has to engage a truck or part of a truck and the expenses very great.

I approached the Southern Mahratta Railway on this subject but they declined to do it. The railway freight in several instances is more than the value of the calf.

Fodder and cattle food should be carried on the railway at a concession rate.

(c) Encouragement of cattle breeding in Assam.

(J. N. CHAKRAVARTY, B.A., M.S.A., M.R.A.S., Deputy Director of Agriculture, Assam.)

In Assam, apart from other natural disadvantages, the greatest obstacles to improvement of cattle are the difficulties of securing suitable grazing grounds and breeding bulls. In the Surma Valley there is now hardly any land where cattle breeding can be carried out on an extensive scale except in isolated areas in the District of Cachar. In the Brahmaputra Valley, however, there are still fairly large tracts of waste land where cattle breeding can be carried out on a commercial scale. A good deal of this, however, is being rapidly taken up for cultivation by the pressure of increasing population. If the breaking up of fresh land goes on at the present rate, there will, in a few years, be little pasture left, and the areas which are at present being used for the purpose are also likely to be encroached upon. Steps should, therefore, be taken to reserve certain areas for cattle breeding, before it is too late. As most of the waste land in this province belongs to the Government, this should not present very serious difficulties. To enable this to be done, a careful survey should be made of the areas likely to be suitable for the purpose.

The question of supply of bulls is still more difficult. Few people, including the professional graziers, realize the importance of good bulls, and are willing or able to incur the expenditure necessary to procure and maintain these. Moreover, unless steps are taken to minimise the risk of casualty from contagious diseases, it may not, in many places, be really profitable to invest any money on high bred pedigree bulls. The present practice of grazing several herds together will also have to be discontinued. An extensive propaganda should, therefore, be conducted to educate people in the importance of using good bulls only. The propaganda should include actual demonstrations. Steps should also be taken to supply good bulls to breeders who are willing to maintain them. In the beginning these bulls have to be supplied free or at partly reduced prices. As, however, people begin to realize their importance, it should be possible to gradually increase the price until the cost price is charged. Good bulls produced by any breeder should also be purchased by the Government to be distributed in suitable centres in accordance with the above scheme. It is extremely doubtful whether the initiative will come, at least in this province, from the breeders or the general public. Nor are they likely to spend any money on superior bulls unless they get some help in the initial stages. Without some such scheme, the task of introducing superior bulls and effecting any improvement in cattle appears, therefore, to be very remote.

(d) City milk supply.

(i)

(ZAL R. KOTHAVALA, B.A., B.Sc., N.D.D., *Dairy Superintendent, Bombay Municipality.*)

One of the most unsatisfactory features of the milk supply of cities in India is that the major portion of the supply is obtained from cattle stabled in the very heart of the cities. Taking the example of Bombay, nearly 78 per cent. of the total milk consumed is produced by about 15,000 head of cattle stabled in the city itself. This system apparently dates back to the time when there were no railway facilities and land in urban areas was cheap. The only merit contained in this system is that the milk is produced just near the place of its consumption and can be supplied fresh without raising any problems of transportation, but this is many times outweighed by the dangers which attend its production in a crowded city by methods which are very primitive. There is further the great danger to the health of the inhabitants on account of the proximity of the stables. Besides these objections from the point of sanitation, certain economic factors have arisen of recent years which make clean and cheap production of milk in urban areas economically impossible. The first step, therefore, in the improvement of the milk supply of any Indian city is the removal of the stables from the town and the supply of milk from rural areas. Production on dairy farms should be the ultimate goal. But during the several years that must elapse between the substitution of a city supply by a country supply certain important economic problems arise which must be solved. Of these, the two most important are:-

- (1) The slaughter of milch animals brought to city stables for milk production; and
- (2) the supervision of the milk supplied from the suburbs.

As regards the first, the slaughter of prime animals, it is not anticipated that the last stable in the city will disappear before a score of years yet. Till then the wanton destruction of useful animals will continue as at present if not checked. This practice, which exists to a fearful extent in Bombay, has not only drained the Bombay Presidency alone of its best breeds, but its effects are felt even in North India whence the Delhi buffalo is imported in fairly large numbers for the Bombay milch-cattle stables. Figures of the buffaloes slaughtered at the Bandra municipal slaughter-house annually show a rise from 8,371 in 1915 to 11,536 in 1922; this gives a vivid idea of the annual destruction of the precious animals and emphasizes the necessity of devising some measures.

The Bombay Municipality recently made a move in the matter by adopting a resolution for the prevention of the slaughter of all animals under the age of 8 years at the municipal slaughter-houses. This measure though full of good intentions will work to certain grave disadvantages in practice as far as the agriculturist is concerned, for the only venue of the disposing of the weedy and useless animals will be closed. At the same time some such measure as would save the useful animals without preventing the slaughter of useless animals is urgently necessary. With this end in view the measure requires, in my opinion, to be so modified as to make it ap-

aplicable only to milch animals brought to the city stables and not to all animals in general slaughtered at the slaughter-houses. Comments on this are invited. The proposal can be given effect to by maintaining a register of all animals imported into Bombay, in which age will be the determining factor. The animals so registered, if they are below the age limit, should be prohibited from being slaughtered at slaughter-houses when they run dry. The adoption of some such measure appears to me to be the only remedy within the power of the municipality for the evil under the present circumstances. As for the animal thus saved, if proper inducements were offered by providing facilities for land by Government, not far away from the city, they could be kept till their next lactation either by individuals or through the efforts of limited concerns. Here a remark is necessary as to the experience in the past with these dry animals. It has been said they cannot breed any more and the reasons advanced are:—(i) That the food given in city stables is too rich in nitrogenous matter and on account of want of exercise fatty degeneration sets in and the animal is incapable of further breeding. (ii) The pernicious "phuka" method practised by the *gawdis* in avoiding to cover the animal while in heat, incapacitates the animal from bearing calf again.

While there is truth in the first statement it does not in itself form any unaccountable difficulty. On the other hand, it has been ascertained that if the animal is covered in right time instead of waiting till it gets dry, it bears calf like any other animal in spite of the rich food it gets. And this is being done in case of exceptionally good animals by the city *gawdis*. If any doubt is still felt about it the Local Government cattle experts should take up this question and thoroughly investigate it.

As for the second reason, if the *gawdi* is forced to dispose of his animal when dry in any other way than to sell it to the butcher, by adopting some such measure as suggested above, he will undoubtedly be forced to abandon the present pernicious practice if he wants a customer for his dry animal, which must of necessity be a cattle breeder.

This question is brought before the Conference in view of the fact that the prohibition of the slaughter of the cattle is being decided upon by most of the principal municipalities in this country. At some places only a partial prohibition is carried out, while at places where religious sentiment is running high, total prohibition is advocated. The result of such a policy would be disastrous as far as the agriculture of the country is concerned and would prove ruinous to any scheme for the improvement of the cattle. The Conference, therefore, after debating on the question, should make its recommendations to the municipalities concerned and insist on co-operation from Government on the following points:—

- (1) The inadvisability of the total prohibition of the slaughter of cattle in municipal slaughter-houses as detrimental to the agricultural interests of the country.
- (2) The desirability of protecting useful milch animals brought to the cities by some such method as suggested above.
- (3) The desirability of substituting the present method of milk supply from cattle stabled in the city by a supply of milk produced on dairy farms in the country.
- (4) The grant of conveniently situated land by Government at concession rates for the purpose of maintaining dry animals obtained from city stables.
- (5) The grant of concessions by railways for the transport of dry animals from the city to the breeding grounds.
- (6) Introduction of stud bulls by Government in the city stables.

As regards the supervision of milk supplied from the suburbs, this factor is more important from the point of health of the community than from any economic consideration. Mere removal of the cattle from the city to the suburbs or to any place beyond the municipal limits will not solve the problem of a cleaner and cheaper milk supply for the city. On the contrary, were the animals to be shifted to places where the municipality has no jurisdiction, powers or where there is no organized system of supervision, the milk imported into the city from such places will always be attended with grave dangers so that the remedy may prove worse than the disease, even if powers were obtained by the municipality by legislative enactments to control and supervise the area roundabout which form the milk supplying sources of the city, due to the present unorganized state of the milk trade and the great number of herds in which the milch animals will be scattered. Supervision over the production by a single municipality will prove very difficult and expensive if not impossible. Production on dairy farms started for the purpose would be detrimental and the only possible solution of the problem, but before this stage of perfection is reached, measures such as would ensure a safe milk supply from the suburbs through efficient supervision are very necessary and discussion on this subject is invited. This, in my opinion, could best be achieved through the co-operation of the local bodies and the municipality lying within a certain radius of the city to which the milk from those areas is supplied. This system can be given effect to by adopting a uniform and common standard of laws and by-laws as regards the stabling of animals, sanitation, etc., so that when a permit for selling milk

in the city is applied for by a producer his ability to produce safe milk could be attested to by the local municipality in which the animals are stabled. In case of areas without the jurisdiction of any local municipality the Government must co-operate by taking up the responsibility and even extending the services of its inspectorial staff to the local municipalities whose revenue does not permit of adequate staff being kept for efficient control.

The advantage from such a control to the city will be that the public will be assured of a safe milk supply, while the local municipalities or the controlling bodies will gain by increased revenue obtained through the fees for stabling of animals within their jurisdiction.

(ii)

(ZAL R. KOTHAVALA, B.A.G., B.Sc., N.D.D., *Dairy Superintendent, Bombay Municipality.*)

The problem of the milk supply in Bombay city is a most pressing one to-day, and I feel it might interest the members of the Board to know something of the difficulties which have to be contended with and the measures that are being taken to contend with those difficulties.

The problem is not of course confined to Bombay; it is common all over the country. It is vast and intricate and the efforts of one or more individuals or of a city or Corporation, will not go very far. The problem must be tackled as a national problem. In Bombay city with a population of 11,75,914 the total quantity of milk consumed per day amounts to 23,000 gallons. That means that the per capita consumption amounts to 3.1 oz. This figure as compared with the per capita consumption in U. S. A., which amounts to 20 oz., and in the United Kingdom, which amounts to 10 oz., is very low. With its large vegetarian population, Bombay ought to consume more and it shows that if more milk were procurable more would be consumed. The supply is smaller than the demand and the present unsatisfactory and dear milk supply is the result. Of the total quantity of the milk consumed daily, 18,000 gallons, i.e., 78 per cent. are produced within the city itself. To produce this quantity in all about 15,000 head of cattle are stabled in the very heart of the city. Of the remaining quantity, 4,856 gallons, i.e., 21 per cent., are brought by rail from the suburbs and beyond, while the remaining 142 gallons, i.e., 1 per cent., are brought to Bombay from outlying places by road.

The distribution of all this milk is being done either by the producers themselves or by retailing at milk shops and through city dairies. Of the last, it is very disappointing to find that there are only two or three which are worked on up-to-date principles of business and sanitation. The distribution of milk in the city leaves much to be desired. Little or no attention is paid to cleanliness in handling, while the method of transportation is crude and imperfect and the risk of contamination during transit is very great.

As regards control and inspection of the city's milk supply, it is unfortunate that I cannot deal with this part of the subject as fully as I would like to. Strange as it would appear, the supervision of the city's milk supply forms part of the duties of Assistant Health Officers in charge of the different wards. The city can boast of a splendid set of milk ordinances, but they are like arms lying useless without any soldiers to use them. Till 1922 there were only 5 Sub-Inspectors to look after the milk supply of the entire city. These men, in addition to inspecting milk while in transport through the agency of about 5,000 milk vendors and a large number of milk shops and taking test samples for examination, had also to issue summons and attend Courts. The effect of inadequate staff and the consequent inefficient supervision was reflected in the quality of the milk sold. In 1921 about 989 milk samples were examined. Of these, 650, i.e., 65 per cent. were of adulterated milk. The amount of water added varied from 16 per cent. to 86 per cent. From the middle of last year, the work of taking samples was assigned to the Medical Inspectors in addition to the Milk Sub-Inspectors. The number of samples taken every day increased from about 4 to 29. In 1922-23 the number of samples analysed amounted to 2,860. Of these, 1,700, i.e., 61.4 per cent. showed adulteration. Up to June 1923, 2,404 samples were analysed. Of these, 42.1 per cent. were of adulterated milk. It will thus be seen that since the inspectorial staff was supplemented and more rigid steps taken to inspect milk, the percentage of adulterated samples that were detected decreased from 65 per cent. to 42 per cent.

The responsibility of the supervision of the milk supply and the licensing of the trade is not only divided amongst several executive officers, but it is even divided between two departments. The fearful child mortality of Bombay is an eloquent testimony to the imperfect method of production, distribution and supervision of the city's milk supply. It has now been

definitely proved by the experience gained in some of the principal cities in U. S. A., that the milk supply has a direct bearing on child mortality. The price at which milk is sold in Bombay is 13 times dearer than in U. S. A. and 12 times dearer than in United Kingdom. This high price of milk is due partly to the demand being greater than the supply but principally to the production of 78 per cent. of the milk in the very heart of the city where conditions are anything but favourable for cheap production. Another very undesirable result of this system of stabling milch cattle in the heart of the city is the slaughter of prime animals brought to Bombay for the purpose of milk production. No fewer than 11,530 buffaloes were slaughtered at the municipal slaughter-house in 1921-22, while at Kurla, a suburb near Bombay, almost a similar number was slaughtered. All these animals come from the Bombay milch cattle stables and in most cases they are in the prime of life having been imported with the 2nd or 3rd calf. This unrestricted destruction of really useful animals that has been going on for so many years is causing a serious drain on the economic resources of the country of which the effects cannot but be felt. It is here that Government can be of great help by devising ways and means to meet this situation. The Bombay Municipality has already decided to put a stop to the slaughter of all animals below the age of 8 years, with a view to save the wanton destruction of milch cattle coming to Bombay. But if this measure is not to result in harm in another direction, it should be confined only to the milch cattle imported for the city stables.

This state of affairs is not by any means one of which any municipality or executive body could feel proud, but it brings forth clearly both the importance and the extent of the problem to be solved. Not only is the trade required to be rebuilt on sound principles of business and sanitation, but before this can be done the deep-rooted evils established by ignorant and unqualified producers are to be eradicated first. The Municipality was alive to the situation and its first efforts to bring about an improvement can be traced as far back as 1912. It was not, however, till the year 1915 that some results of these efforts were visible. In this year the Milk Committee appointed by the Corporation approached Dr. H. H. Mann to advise them in the matter. The Committee could not have selected a better man for the purpose. At that time Dr. Mann after studying the whole situation carefully, submitted in 1916 an interesting report over which he devoted considerable energy and labour. One direct and immediate result of the report was that the Corporation decided that no more milch cattle stables should be allowed to be erected in the city, and that on sanitary grounds the existing stables should gradually be removed to a suitable place outside the city; while the cattle should be housed in up-to-date stables with clean surroundings. It was also realized that for the purpose of reorganizing the milk supply and devising ways and means to improve it, it was essential that there should be a whole-time officer. This brought about my appointment in April 1922.

As a first step towards reorganizing the supply of milk from the suburbs, the Municipality decided to build a set of model stables at Trombay about 12 miles from Bombay. The Development Department, which has undertaken the development of Trombay, has earmarked an area of about 350 acres for milch cattle stables, of which 40 acres are being acquired immediately. To begin with, it is proposed to construct a yard of four stables to accommodate 500 cattle with necessary buildings and the provision for paddocks for exercise and open ground for the grazing of the cattle. These stalls will be let out to gowls, and in the case of owners of a large number of cattle, the Municipality may allow the owners to construct stables at their expense according to sanctioned plans on land leased from the area reserved by the Municipality. The Municipality will be responsible for water supply and sanitary services and it is hoped that a supply of electricity will be available also. With all these facilities and clean stables constructed on the most up-to-date principles the milk will be produced under almost ideal conditions. As regards the transport of the milk from Trombay to Bombay, there is a fine road connecting the two places and the Municipality will provide the necessary vehicles. Later, it is expected that there will be a direct connection by railway of which a beginning has already been made. In the light of experience gained, further stables will be erected at Trombay.

The Trombay scheme, while forming the basis of a suburban milk supply, cannot by itself solve the whole problem, unless it was supplemented by some other scheme to meet the enormous demand that will be created by the removal of cattle stables from the city. In the circumstances at present existing there was no private enterprise forthcoming to start a dairy farm unless some help was guaranteed by the Municipality. The only alternative to this was the starting of a dairy farm by the Municipality itself. As regards the former, a private limited company proposes to start dairy farms at two places, one at Telegaon on the G. I. P. Railway and the other at Bulsar on B. & C. I. Railway. All the milk produced at these places would be sold in Bombay through the company's agency. The company is prepared to grant the Municipality the right of inspection of the farm and the accounts and to take such measures as would ensure proper management of the concern. In return, the company has asked that a dividend of 51 per cent. per annum should be guaranteed to the shareholders for ten years, the Municipality to make up the deficit in case the profits of the company do not allow the payment of this dividend. The advantage of a private enterprise, even under these terms, to a municipal enterprise which has nowhere succeeded, are obvious. Both the proposals are at

present under the consideration of the Municipality. I should not fail to refer here to the invaluable assistance received from Mr. W. Smith, Imperial Dairy Expert, both in connection with this scheme and the general policy to be adopted.

Even after the establishment of a suburban milk supply certain measures will be quite necessary as regards the inspection and control of the milk, after it enters the city, to ensure a clean supply to the public. Unless there is proper and efficient supervision, the traders in unadulterated milk will have no chance against those who adulterate their milk with water. It is necessary to emphasize this point very strongly otherwise all the grandiose schemes for clean and cheap milk supply would come to nothing.

In the first place the present system of inspection needs complete overhauling. The prime factors in efficient control and supervision are the centralization of the administrative powers and an adequate and well-trained staff. These have been urged upon by all the Milk Commissions investigating the problem in various parts of the country, and wherever they have been adopted a clean and safe milk supply to the public has been assured. The division of responsibility between more than one department and between different executives and the secondary importance given to milk inspection work where this forms part of the other duties of an official, has to a great extent been responsible for the present deplorable state of affairs. If any headway is to be made in the direction of improving the milk supply, it is in my opinion necessary to have a separate milk department, where all work in connection with the inspection, supervision, etc., of the milk supply could be centralized.

Before concluding, I should like to refer here to public apathy in this matter; whatever be the magnitude of a scheme involving the welfare of the public, progress with it is difficult, if not impossible, if there is no intelligent appreciation by the public of the measures undertaken. In order that the progress of the measures in contemplation by the Municipality may be expedited, co-operation from the public was sought for by making proposals which were conducive to a cleaner and cheaper milk supply. But neither an appeal to the religious sentiments of the people nor to the profits involved in the enterprises had any effect.

The whole situation has been and is under very careful consideration. I must admit that very little progress has so far taken place and there is hardly any tangible result to which I can point with pride. But you will agree that progress must of necessity be very slow where a public body like Municipal Corporation is concerned, where the problem is so vast and intricate, where the evils connected with the problem have been deep-rooted for so many years and where we have to deal with a class of people of so backward a type as the *scullies*. Fortunately there is at the head of the Health Department and also at the head of the Corporation officers who are keenly interested in this particular problem and they are doing all they can toward its solution.

(iii)

(J. N. CHAKRAVARTY, B.A., M.S.A., M.R.A.S., Deputy Director of Agriculture, Assam.)

Although the question of milk supply to large towns is the main topic for consideration, it is hoped that the question of small towns is not to be rigidly excluded. Even in small towns the supply of pure milk is getting an increasingly difficult problem everyday. In Jorhat and many other towns in Assam, milk, or whatever passes by that name, is sold at 5 to 6 annas per seer and delivery can be rarely obtained before midday. The only course open to a person who wishes to have a supply of pure milk in the morning is to keep his own cows. As the demand of each individual is rather small, the maintenance of one or two cows separately is not economical. Moreover facilities for grazing are getting scarce in all towns and the price of fodder going up very quickly. There is also the danger of infectious diseases where animals from different house-holders are grazed together. If one has a good cow there is also the additional difficulty of securing a good bull for service. Taking all these facts into consideration, it will be realized that even in small towns it is not economical to keep one's own cow. The number of professional *gawalas* in these towns is very few and the business is largely in the hands of men with whom cow-keeping is only a side occupation. He has other important work to attend to and can only devote part of his time and attention to his cow.

The cases of these small *gawalas* are not very much better. They have to face all the above difficulties to a greater or less degree. An ordinary Assamese cow, of superior type, will only give one to two seers of milk, many giving much less. It is not a paying proposition for any one to maintain such a cow, but under the present conditions very few *gawalas* are willing to invest

in superior cows. The main reasons why the milk is getting scarcer in almost every locality may be summarized as follows :—

- (1) Gradual deterioration of the cows, due to want of good bulls and good feeding.
- (2) Want of grazing grounds.
- (3) High price of fodder and food grains.
- (4) Want of professional men to devote their whole time to the business.

It seems to the writer that unless regular dairy farms are started where superior type of cows can be kept without danger of infection from outside and where arrangement can be made to grow fodder crops, very little improvements can be expected in the milk supply even of small towns. For various reasons, which need not be gone into detail here, a joint stock dairy farm is not likely to be successful in small towns. Success in dairy farming will depend very largely on the honesty and the capacity of the manager. A suitable man will not be available except on a very high pay, which a comparatively small farm will not be able to afford. The time has not yet come when substantial business-men will invest money in this trade. They will first have to be shown by actual demonstration that it will bring a fair return for the capital invested.

The only course which appears to have some chance of success in small towns is for a few interested people to combine together and start a dairy farm on a co-operative basis. The farm should be situated within 2 or 3 miles of the town, so that the question of supervision and delivery of milk may not present great difficulties. 50—100 acres would perhaps be a suitable size for such farms. In many mofussil towns, at least in Assam and North Bengal, it may be still possible to secure suitable land for the purpose at reasonable cost. In some cases it may be necessary to acquire land for the purpose. If necessary, this should be done by the Government on behalf of the co-operative society. Membership should be confined to actual consumers who should subscribe the bulk of the capital, in any case not less than half, the balance being borrowed from the central co-operative banks. An officer of the Agricultural Department should be an *ex-officio* member of the managing committee, and advice and help should be freely given by the officers of the department. One or two suitable bulls should also be supplied by the department and the male progeny may be taken over by the department at a reasonable price for use as stud bulls, as the bulls of these farms are likely to be superior to the ordinary bulls provided they are fed properly. To avoid all risk it may be desirable to begin with local and acclimatized cows, but as experience is gained animals of superior type from other provinces might be imported. But in any case none but the best animals should be used, as with a good nucleus it may be possible, later, to build up a really good herd. A careful milk record should be kept for each cow, so that all inferior animals may be discarded. By following these methods systematically for a few years not only will the supply of pure milk be ensured but there will be a distinct improvement in the cattle.

